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POULTRY HOUSES
AND
EQUIPMENT

J. E. DOUGHERTY and H. L. BELTON

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A modern California poultry house. Observe the large amount of curtain front for the admission of direct sunlight.

POULTRY HOUSES AND EQUIPMENT

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Climate is an important factor in poultry house design and from table 1 can be obtained a reasonably comprehensive grasp of the general climatic conditions of the state. The climate of California is such that shelter from rain, wind and heat, rather than protection from intense cold, is one of the principal functions of a poultry house.

REQUIREMENTS OF A CALIFORNIA POULTRY HOUSE

The fundamental purpose of a poultry house is to promote the comfort and health of the stock it houses. This purpose should receive the first consideration of the designer and builder.

Storm-Tight and Dry.—Dryness checks the development of most disease organisms and increases the comfort of the birds. It is therefore an important essential of a well designed poultry house.

Ventilation Without Drafts.—Ventilation is essential in a poultry house to supply the birds with enough fresh air to meet their body needs and to carry away the exhaled air and the unhealthful fumes arising from the droppings. Ventilation must be provided without injurious drafts from cracks, knot holes, etc., which would chill the birds while roosting and lead to colds and roup. Ventilation is needful; drafts may be dangerous.

Direct Sunlight in Winter.—In order to admit a maximum amount of direct sunlight in winter a poultry house should face south. Where this is not feasible, a southeast facing would be second in order of desirability, and east, third. North is an undesirable direction in which to face a poultry house.

The mere fact, however, of facing a poultry house south will not insure a maximum amount of direct sunlight entering the house unless it is properly designed. For example, the sun's rays reach the earth in December in this latitude at an angle of approximately 25° from the horizontal. This means that rays of sunlight entering a poultry house in winter at a height of 8¼ feet (figure 1) would extend back

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over the floor of a house 18 feet deep, nearly to the rear wall. If, however, the highest opening through which direct sunlight could enter were only 6 feet above the ground, the sun's rays would extend into the house for a distance of only 13 feet. Hence the vertical length and the area of the openings in the front wall, as well as the

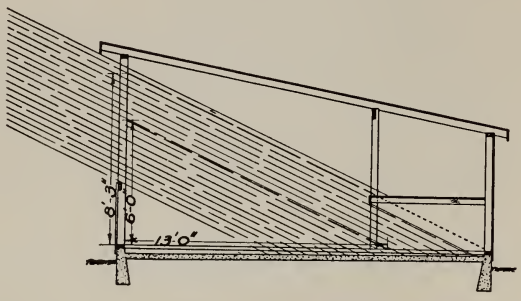


Fig. 1.—Showing how the height and vertical length of the front openings affect the amount of sunlight that enters a poultry house in December and the distance it extends back toward the rear wall.

TABLE 1

CLIMATOLOGICAL DATA FOR THE YEAR 1924, AS A FAIRLY TYPICAL YEAR

(Blank spaces indicate data not available.)

Station	Clear	Partly cloudy	Cloudy	Precipitation of .01 in. or more	Dense fog	Temp. of 32° F, or below	Temp. of 90° F, or above	Max. temp. for year	Min. temp. for year	Total rainfall
	days	*days*	*days*	*days*	*days*	*days*	*days*	*deg. F*	*deg. F*	*inches*
Atascadero	290	51	21	34				105	6	11.86
Bakersfield	239	87	40	28				110	21	3.99
Davis	300	35	31	38				107	20	13.85
Escondido	286	40	40	44				105	26	12.72
Eureka	103	101	162	117	57	10	0	81	24	27.53
Fresno	259	63	44	31	16	12	108	109	24	7.26
Hayward	262	26	78	55				99	23	15.24
Los Angeles	232	100	34	29	8	0	5	102	36	8.11
Merced	266	39	61	41				109	19	9.03
Napa	309	22	35	58				95	22	20.04
Oroville	256	31	79					109	20	
Petaluma	305	41	20	45				101	21	19.94
Pomona	201	139	26	44				102	25	13.57
Porterville	262	26	78	30				110	23	9.41
Red Bluff	258	58	50	51	7	28	107	108	17	17.09
Sacramento	263	55	48	44	20	13	54	102	25	12.67
Salinas	224	89	53	39				91	19	9.34
San Diego	191	117	58	39	24	0	0	88	36	5.68
San Bernardino	236	102	28	37				105	23	12.42
San Jose	234	67	65	46	19	23	9	98	22	9.51
San Luis Obispo	253	81	32	42	12	9	3	99	30	10.19
Santa Ana	171	69	126	37				103	26	10.50
Santa Cruz	296	12	58	29				94	24	16.45
San Francisco	196	83	87	51	18	0	0	88	36	20.17
Stockton	288	27	51	37				102	25	11.11
Ukiah								113	19	10.41

direction in which the house faces, control the amount of direct sunlight that can enter the house.

The poultry houses described in this circular have a shed roof as this style of roof provides at low cost the size and shape of openings most effective in admitting winter sunlight.

Sunlight increases the comfort of the birds in winter by bringing warmth and cheer into the poultry house. It is a powerful drying, disinfecting, and purifying agent and is nature's source of ultra-violet light (table 2).

TABLE 2*

Comparison of Sunlight, Cod Liver Oil, and Ultra-Violet Light from a Quartz Mercury Lamp, as Sources of the Anti-Rachitic Factor for Laying and Breeding Hens

Treatment	Per cent average egg production for 21 months	Per cent chicks hatched to fertile eggs set. Average of 13 hatches	Average shell thickness for a period of 18 months in millimeters
Confined. No direct sunlight	14.2	11.6	0.26
Confined. Direct sunlight through open front	27.9	30.0	0.30
Confined Direct sunlight through open front. Two per cent cod liver oil in dry mash	32.8	41.9	0.32
Confined. Direct sunlight through open front. 15 minutes of ultra-violet light daily	36.8	54.7	0.31
Large bare yard	38.1	62.4	0.33

* This table is a brief summary of the results obtained for the first 21 months of a study begun Dec. 1, 1925, at the California Station, and still in progress.

Ultra-violet light has been found to possess properties similar to those of the vitamin D contained in certain foods in bringing about a normal utilization of the calcium and phosphorus consumed in the ration. Laying hens need to assimilate large amounts of calcium to produce strong-shelled eggs. Growing chicks must utilize both calcium and phosphorus for bone building. Rickets is due either to an inadequate supply of calcium and phosphorus in the ration or to an inability to absorb and utilize these mineral elements from the food eaten. The minerals needed are easily provided but there must also be supplied that factor which enables the bird to use them for its body needs.

Whenever poultry of any age can be exposed to direct sunlight, it is not necessary to include in the ration feeds rich in vitamin D. Direct sunlight has not only been proven to be both a preventive and cure for rickets but it also seems to stimulate egg production and improve both the strength of shell and the hatching quality of eggs laid.

Coolness in Summer.—It is equally as desirable that a poultry house be cool in summer as it is that it be comfortably warm in winter. Fowls suffer extremely from high temperatures, particularly in late spring, before they have become adjusted to hot weather. The mortality from this cause, especially in adult stock, may result in greater annual losses than from disease. Shade and a free circulation of air are perhaps the most practical means of keeping a poultry house cool and preventing losses from heat prostration. Sprinking the floor sufficiently to dampen the litter and hosing the roof and muslin curtains frequently on abnormally hot days also aid in reducing the temperature of the interior of the house thus causing the birds to suffer less discomfort.

Large deciduous trees that shade the front and roof and are not too close to be objectionable represent one of the most desirable ways of protecting a poultry house from the hot summer sun. Lacking trees, however, muslin curtains extended as awnings will serve to shade the interior of the house. (See page 17 for discussion of curtains.)

Ease of Cleaning.—The shape and construction of droppings board and roosts, as they affect ease of scraping off the droppings; the size and shape of scraper used; the capacity and ease of handling of manure box used in cleaning—all are important factors in saving time and effort. For example, a droppings board over 6 feet wide is difficult to reach across with a scraper sufficiently heavy and with enough scraping surface to permit of rapid work. Cleaning is facilitated by stretching wire netting (figure 2) or rods beneath the roosts, to keep the birds away from the droppings. They then cannot walk on and pack them down, and cleaning is made less difficult.

There accumulates between 8 and 9 pounds of dirt and droppings per 100 fowls per day on the droppings board of a laying house. If these boards were cleaned three times a week, about 30 pounds of manure would have to be removed each time from a pen 18 $\times$ 20 feet in size, holding 150 fowls. For such work a litter carrier is amply large and very convenient. On the other hand in cleaning the floor of a laying house preparatory to putting in clean litter, there must be removed eight or more wheelbarrow loads of dirty litter, if cleaning is done every six weeks. A wheelbarrow, or overhead litter carrier, being very limited in capacity, would necessitate too many trips to expeditiously handle this amount of litter. A low wagon is more suitable and further on is described removable 8-foot wide panels at the house end of each line fence which permit of driving a wagon

along in front of the house so that it can be backed up to the front door of any pen. Then the litter can be shoveled into it and removed in one load from a pen 18 × 20 feet in size.

Well Drained, Durable Floor.—Scratching litter is a source of much dust, consisting as it does of more or less pulverized litter and droppings, and the dirt tracked in from out-of-doors. Every ledge accumulates a layer of dust. Cobwebs also accumulate rather rapidly. Fresh droppings are tramped into the floor and dry fast. A large part of this material can be removed with scraper, shovel and broom

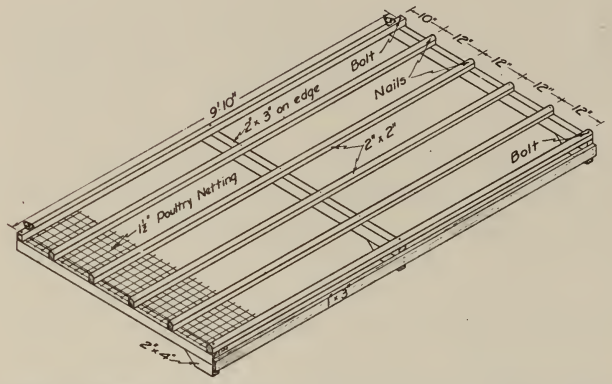


Fig. 2.—Detail showing construction of a section of roosts with wire netting stretched under them. Netting with 1½-inch mesh is recommended for this purpose. A larger mesh permits eggs laid on the wire to fall through and break or get badly soiled; the droppings do not readily pass through a smaller mesh. The roost section shown has only five roosts and 2 × 4 inch blocks are used for legs. A section of six or more roosts would be built in the same way, however, and 2 × 2 inch or any other kind of satisfactory legs can be used.

but much of it cannot. Yet in disinfecting surfaces coated with even thin layers of dirt, the efficiency of the application is greatly reduced for the disinfectant is absorbed by the dirt before it can reach and kill the germs. To thoroughly clean a hen house from ceiling to floor, it should be scrubbed and hosed out before it is disinfected.

In hosing out a house having a board floor, the boards will absorb a great deal of water, unless they have been thoroughly impregnated with oil, and will in time curl or dish making the floor corrugated and difficult to scrape. It is also rather difficult to lay a board floor so that it will drain well. A concrete floor, on the other hand, is more easily scraped, does not splinter, is not affected by water, and can readily be laid to provide ideal drainage conditions as indicated on the floor plan, figure 29. In most instances a concrete floor is also as low in first cost as a good board floor and will last indefinitely, whereas wood is subject to decay.

Floor and Roosting Space.—Crowding is detrimental, whereas giving birds more house room than they can effectively use increases investment and operating costs. As a result of an extended study of the space needs of different breeds of fowls the tabulation in table 3 has been formulated:

TABLE 3

RECOMMENDED FLOOR SPACE PER BIRD

Number of birds in a pen	Light breeds, such as Leghorns	Heavy breeds, such as Rhode Island Reds and Plymouth Rocks
1–50	3½ sq. ft. floor space	4½ sq. ft. floor space
51–125	3 sq. ft. floor space	4 sq. ft. floor space
126–200	2½ sq. ft. floor space	3½ sq. ft. floor space
Over 200	2 sq. ft. floor space	3 sq. ft. floor space

To illustrate why larger flocks require less floor space per bird than small flocks, let us consider a house 14 feet deep and 50 feet long divided into five pens, each containing 40 birds. The pens are 14×10 feet in size and allow $3\frac{1}{2}$ square feet of floor space per bird. If, however, two of the pens were thrown together, each bird would have twice as much floor space to move around in as it had before. Throwing three pens together would give each bird three times as much floor space and so on. It is evident, then, that increasing the size of the pen increases the total floor space available to each bird. Because of this fact the average floor space per bird can be reduced a certain amount without harm to the stock since each bird will have a much larger floor space to exercise in than it had in the smaller pen.

It is not enough, however, to consider only floor space in determining the hen capacity of a poultry house or a pen within that house. Sufficient roosting space must also be provided. For light breeds such as Leghorns six linear inches is considered the minimum and eight linear inches the optimum amount of roosting space per bird. For the larger breeds, such as Rhode Island Reds and Plymouth Rocks, these measurements should be increased two inches. The minimum amount of roosting space would probably be found sufficient in cold weather but in hot weather the birds would be crowded too close together.

Location of Equipment.—A major problem in designing the interior of a poultry house is the placing of equipment. It is desirable to place appliances off of the floor where they are least in the way. Watering devices and feed hoppers located in the middle of the floor, even though on legs, obstruct the light and are more or less "under foot." Nests below the front of the droppings board tend to darken

the floor back of them and make it difficult for the poultry keeper to observe birds in the rear of the house and note ailing individuals.

The side and front walls represent the most desirable locations for equipment. The amount of such wall space, however, is usually insufficient to take care of the equipment needs in even a small pen and as the size of the pen is increased, wall space increases less rapidly than the space needs of feed hoppers, nests, etc. For example, a pen 18 feet deep and 20 feet long will care for 150 Leghorn hens and allow 2.4 square feet of floor space per hen. If the droppings board extends approximately 6 feet out from the rear wall and there is a 3-foot door in each side wall adjacent to the droppings board (figure 26), the amount of space on each side wall available for equipment would be 9 linear feet. With a 3-foot door in the center of the front wall, there would be left 17 linear feet on the front wall for equipment. This makes a total of 35 feet. If the pen were 40 feet long instead of 20 feet, the total wall space available for equipment would be increased only 20 feet or 57 per cent whereas the bird capacity would be doubled at least.

On the basis of 1 linear inch of dry mash hopper feeding space per fowl, ½ inch of greens hopper feeding space per fowl, ¼[3] inch of watering space per fowl, 2 feet of grit and shell hopper feeding space per 100 fowls, and at least one nest 10 inches wide for each six hens, the following wall space would be required for 150 fowls:

Wall mash hopper	12 ft. 6 in.	
Wall greens hopper	6 ft. 3 in.	
Water pan	3 ft. 2 in.	
27 nests each 10 inches wide—3 tiers	8 ft. 4 in.	(including nest partitions)
Grit and shell hopper	3 ft. 0 in.	
Total	33 ft. 3 in.	

Unfortunately the problem is even more complicated than has been indicated for the boarded up portion of the front wall below the curtained openings is rather low for self-feeding mash hoppers or tiered up nests and it is not feasible to construct equipment so that every inch of wall space is used without waste. The data above would indicate an ample number of feet of wall space for the required equipment in a pen 18 feet deep and 20 feet long but when one begins to fit this equipment in, it quickly develops that wall space is very limited even in a pen of this size. In a pen 40 feet wide and 18 feet deep the wall space would be wholly inadequate. These facts emphasize the value of a partition at least every twenty feet in providing wall space even though no partition doors are hung in the door openings and two or more pens are thrown into one.

[3] Twice this amount may be needed in hot weather.

FLOOR DIMENSIONS AND CONSTRUCTION COST PER HEN

As has already been pointed out, the hen capacity of a pen is increased as its size is increased, but in greater ratio than is the ratio of increase in the size of the pen. Therefore a reduction in floor space per hen due to an increase in pen size decreases the cost of construction per hen capacity until the minimum allowance of two square feet of floor space per hen is reached. If this minimum is adhered to, there is no saving in construction cost in enlarging the pen unduly. There may be a loss due to the increased hazards from disease, etc., resulting in decreased production of the birds in the larger groups. There is also considerable data to show that large flocks do not lay as well as smaller flocks because of the increased competition among the birds for feed and water and the greater opportunity for cumulative action of the stronger against the weaker birds.

A pen 18 feet deep and 20 feet long is the unit that has been chosen as most economically desirable in designing the commercial type of shed roof poultry house described in this bulletin. To obtain maximum economy in cost of construction per bird capacity, however, a pen double the unit size or 18 feet deep and 40 feet long and with a capacity of 360 birds of the light breeds (table 3) is recommended for layers. This size of pen is readily obtainable by building the house with an even number of units 18 × 20 feet in size and throwing each pair of units together by not hanging a door in the partition or by building only a skeleton partition to hang equipment on. If the complete partition, including door frame, is built, doors can be hung in the door openings at any time and the house thus readily divided into pens 18 × 20 feet in size for trapnesting, for brooding, for sorting, or for pullets of different ages.

The 18 × 20-foot units shown in this bulletin will accommodate 150 fowls and allow each fowl the optimum (8 inches) amount of roost space. The droppings board is 5 ft. 6 in. wide with five roosts on it. But if a poultry keeper wishes to use 40-foot pens for 360 birds as suggested in the previous paragraph, six roosts and a droppings board 6 ft. 6 in. wide will be required. This change can be made by moving the door openings forward one foot and building the droppings board one foot wider.

CONSTRUCTION MATERIALS

A poultry house is usually a long-time investment. Depreciation and cost of up-keep determine the economy of the construction and of the materials used.

Concrete for Foundation.—A reasonably level, well drained site and a concrete foundation are most desirable for a poultry house. A concrete foundation is durable, it holds the woodwork from contact with the moist ground that would promote rotting, and it prevents surface water from seeping into the house during heavy rains.

Building a house off of the ground on blocks or posts makes for inconvenience and increased labor in carrying feed and equipment up and down steps and in using runways down to the yard for the fowls. Unless the underneath space is well ventilated the floor as well as the sills will be subject to more or less rapid decay. Further, unless the house is high enough above the ground for a small dog to run underneath, it soon becomes infested with rats.

There are conditions, however, requiring the building of a poultry house on blocks or posts as, for example, when it is built on a steep slope. This type of construction is shown in figure 24, but is not recommended if it can be avoided.

Building Dimensions and Stock Lengths of Lumber.—The stock lengths into which the framing lumber used in a poultry house is manufactured, are 10 to 20 feet in even feet. Longer lengths are obtainable but are not always stocked by local lumber dealers. Long lengths also cost more than shorter lengths. These facts have been taken into consideration in fixing the dimensions of the houses described in these pages, as will be observed by detailed study of the plans, and every effort has been made to eliminate waste wherever possible in cutting the lumber.

Grades and Kinds of Lumber.—The low walls of a poultry house readily lend themselves to placing siding lumber vertically and to the use of short lengths of lumber. When placed vertically and well nailed, vertical siding will support a good part of the weight of the roof so that the studding can be spaced farther apart than can be done when placing the siding horizontally. Surfaced tongue-and-groove lumber laid vertically is, therefore, recommended for the exterior walls of a poultry house. Defects such as pitch pockets and small, tight knots, do not detract from its value for this purpose. Such material which has been sorted out of the better grades as

inferior because of the defects indicated, usually sells for less than common, rough 1 × 12 inch boards, yet the defects do not in any way injure it for use in siding poultry houses. It lays up well and makes a tight wall. It is surfaced so that it takes less material and labor to paint it than do rough boards. It offers a less favorable environment for parasites. It is usually less expensive than shiplap of equal grade; and the tongue-and-groove joint is tighter than the lap joint.

CONSTRUCTION DETAILS

Constructing a Concrete Foundation and Floor.—A concrete floor and foundation for a poultry house may be constructed by two different methods. The usual method is to pour the walls of the foundation first and later put in the floor. The floor, however, may pull away from the foundation wall and leave a crack all around unless tied to it with metal reinforcing. This method of construction is also more expensive. The second method is to pour both floor and foundation together as shown in figures 3 and 4.

With either type of construction, the proper height of the foundation wall is first determined and the corner stakes of the building driven. Then the estimated amount of material needed for the fill should be hauled in or scraped in with a Fresno scraper before work is begun on the forms. This will eliminate the extra shoveling that would be required if the fill were not put in until after the foundation wall forms were in place. When the fill is in place, it should be thoroughly tamped and packed to prevent any settling that would damage the floor after it is laid.

In using the second method, only the outside forms for the foundation wall are used and the end wall forms are given a slope of three inches from rear to front. The front wall forms are therefore three inches lower than the rear wall forms. This gives the finished concrete floor that amount of fall from rear to front which is not enough to require special cutting of studs or other framing and will not be noticed in the finished building. On level, well drained land, the floor can be as low as six inches above the ground at the front.

After installing the outside wall forms, the earth fill should be well tamped and carefully graded so that the top of the fill will be two or more inches below the tops of the forms depending on how thick the floor is to be made. With a well settled, firm fill, a floor 2 to 2½ inches thick will be found heavy enough for a hen house.

To provide a foundation wall, a narrow trench should be dug all around the house just inside the outside wall forms (figures 3 and 4).

This trench need not be over 6 inches wide but should be deep enough to keep rats from burrowing under the foundation wall. If the inside wall of the trench tends to cave in, it can be sloped inward toward the center of the house or a 1 × 12 inch board can be used as a retaining board. This board need not extend above the top of the earth fill and can be slipped out just before the concrete for any section of the floor is poured.

Fig. 3.—Poultry house floor and foundation under construction. Note the form construction and that the floor and foundation are being poured together.

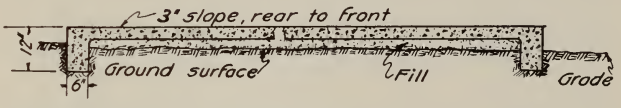


Fig. 4.—Cross-section of floor and foundation. Note slope of floor and thickness of foundation wall, also fill under floor.

In pouring the concrete, the base course should be brought to within ¼ inch of the top line of the finished floor. Then a ¼ inch thick finishing coat should be applied and troweled smooth.

Mixing Concrete.[4]—As previously indicated concrete is very desirable for the construction of poultry house foundations and floors if the slope of the land will permit its use and the materials for the mixing of the concrete are not too expensive for the purpose. Three dollars and fifty cents per cubic yard for such concrete aggregate as sand and gravel and ninety cents per bag for cement is not considered too high a price for such materials for use in the building of a poultry house intended to last ten years or more.

[4] Valuable literature on the mixing and use of concrete can be obtained on application to the Portland Cement Association, 785 Market St., San Francisco.

The proper mixing of the concrete as well as the method of construction must receive consideration if durable, well finished concrete walls and floors are to be obtained. The fine and coarse materials for concrete construction are known as the concrete aggregates. The fine aggregate should consist of sand varying from fine to 3/8 inch in size and having clean, hard, strong, durable uncoated grains, free from injurious amounts of dust, soft flaky particles, alkali and organic matter. The larger particles of the concrete mix, known as the coarse aggregate should vary in size from 1/2 inch to 3/4 inch, and consist of gravel or broken stone. This coarse aggregate should also be clean, hard, strong and durable, and free from injurious amounts of alkali and organic matter. Bank run gravel, as taken from the pit, creek, or river, that meets the above specification for fine and coarse aggregate may also be used for concrete work.

A 1 :2½ :5 mixture of materials is recommended for poultry houses. This consists of 1 bag (1 cubic foot) of cement, 2½ cubic feet of fine aggregate and 5 cubic feet of coarse aggregate. If bank run gravel is used in place of a measured mixture of fine and coarse aggregate, the mix should consist of 1 bag of cement to 5 cubic feet of gravel.

The addition of excess mixing water serves only to dilute the mix and reduce the strength of the concrete. Just enough water should be used in the mix to permit of tamping it to a true even surface.

Mixtures containing both the coarse and fine aggregates are used for foundation walls and for the base course in floor construction. The top or finishing mix for floors however, contains no coarse aggregate. It consists of a mixture of 1 bag of cement and two cubic feet of sand. It is spread over the base coarse to a depth of 1/4 inch to 3/8 inch and is leveled and smoothed with straight-edge, wood float, and smoothing trowel to an even and very smooth surface.

Partitions Between Pens.—As shown in figure 22 each partition is made solid to the top of the partition door header, with 2-inch mesh wire netting above. This construction helps prevent cross drafts on the floor and over the roosts but allows of a free circulation under the roof—an important consideration in summer.

Where the partitions are to be boarded up horizontally, partition sills can be omitted if short lengths of 1/2 inch iron rod or 1/2 inch bolts are set in the concrete floor and the projecting ends inserted snugly into holes bored in the ends of the partition studs to hold them solidly in place.

Hanging Double-Swing Partition Doors.—There are a number of ways of hanging double-swing doors but about as satisfactory and inexpensive a method as any is shown in figures 5 and 6. Two or

three strap hinges, 4 inches in size, are attached to a light door on the side opposite to that on which they would ordinarily be attached. They are then fastened to the door frame in the usual way. With this method of attaching the hinges, the door is not flush with the frame

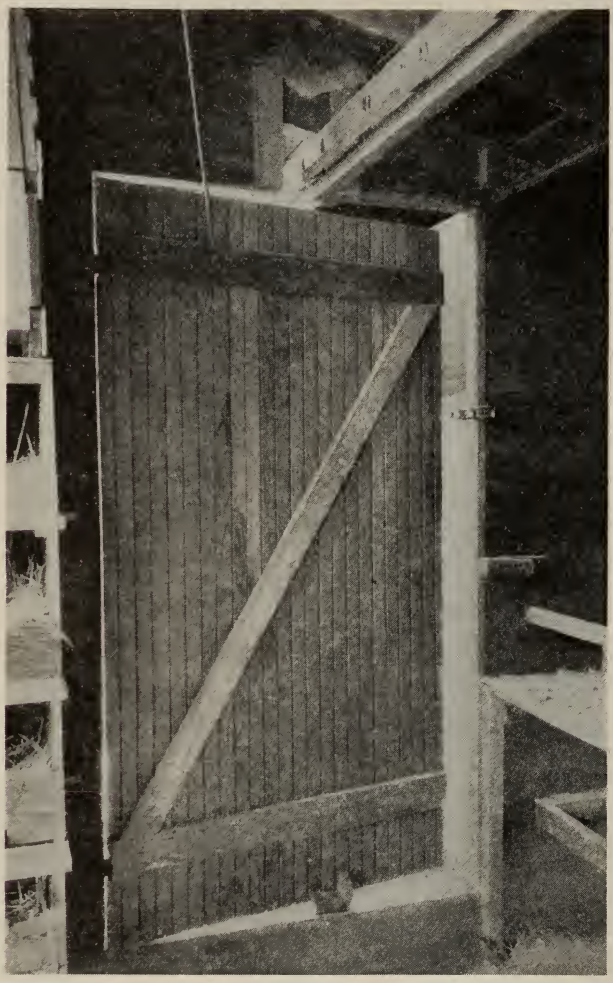


Fig. 5.—A practical, inexpensive way to hang a double-swing, inside door in a poultry house. The door shown, however, is made of too heavy material for the purpose. Note hinges, door catches and springs.

but is offset its own thickness. It will open 90° in each direction giving a full door opening for the passage of a litter carrier. To make it self-closing, coil door springs 3/8 inch in diameter and 16 inches long are attached by one end to the top of the door on each side and at the other end to an adjacent rafter (figure 5). A screen door closer

with a strong spring, such as the Superior, attached to each side of the door frame a few inches higher than the front edge of the droppings board serves to hold the door closed when it is brought back to the closed position by the coil springs. To work properly, the partition door should be made of very light material such as ½ inch resawed lumber.

Outside Doors.—All outside doors are made of the same material as the walls, tongue-and-groove lumber laid vertically. In placing the siding lumber around the door openings, it should stop an inch

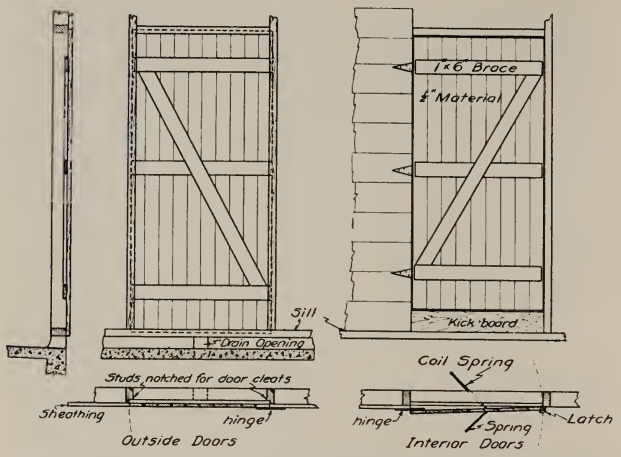


Fig. 6.—Plan for the construction of outside doors and of double-swing inside doors for a poultry house. See *J*, Fig. 22.

from the inside edges of the 2 × 4 inch frame (figure 6). This will allow the door to fit flush with the wall siding and lap the door frame one inch at top and sides. The bottom of the door may extend down as far as desired. The door cleats should extend the full width of the door in order to get a firm nailing for the outside boards, and the frame mortised to receive the ends of these cleats.

Rear Windows.—Where vertical siding is used the framing for the window sash in the rear wall should be nailed in place after the wall has been completely sided and before the window openings are cut. Top and bottom strips of frame should be firmly nailed to every siding board to be cut. Cutting these openings after the wall is finished is cheaper than fitting around the openings as the siding is put on. Each opening should be cut one inch smaller all around than the sash so that it will lap the opening one inch on all sides and thus fit more tightly when closed (cut opening 16 × 28 inches for an 18 × 30 sash). The top of the opening should be 2 inches below the

2 × 4 inch rail supporting the rear edge of the droppings board. This provides a nailing for the wire netting which can be most easily attached to the inside of these openings before the droppings board is constructed.

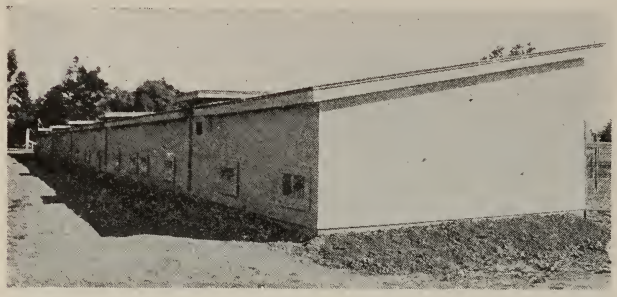


Fig. 7.—Rear view of laying house showing rear windows below droppings board.

To increase air circulation in hot weather, openings in the rear wall near the floor have been found very helpful. The windows in the rear wall below the droppings board shown in figure 7 therefore, serve a double purpose. They light the floor under the droppings board and when they are opened on hot summer days, the circulation of air over the floor and through the house is materially increased. This adds to the comfort of the birds.

Fig. 8.—San Gabriel type curtain with top tipped out to admit sunlight into house. Plan for the construction of this curtain shown in figure 9.

Curtains.—In choosing a curtain for a particular house, one should first determine what that curtain will be expected to do. For example, the three different styles of curtain shown in figures 8, 10, and 12 serve somewhat different purposes. The so-called San Gabriel curtain[5]

[5] This curtain is understood to have originated in the San Gabriel Valley.

illustrated in figures 8 and 9 is intended for use in those localities which are subject to more or less mild storms. Those parts of the state, however, which have sufficiently mild nights in fall and winter and such light rains that this curtain could cope with them are much less extensive than the areas requiring more complete protection than this curtain affords.

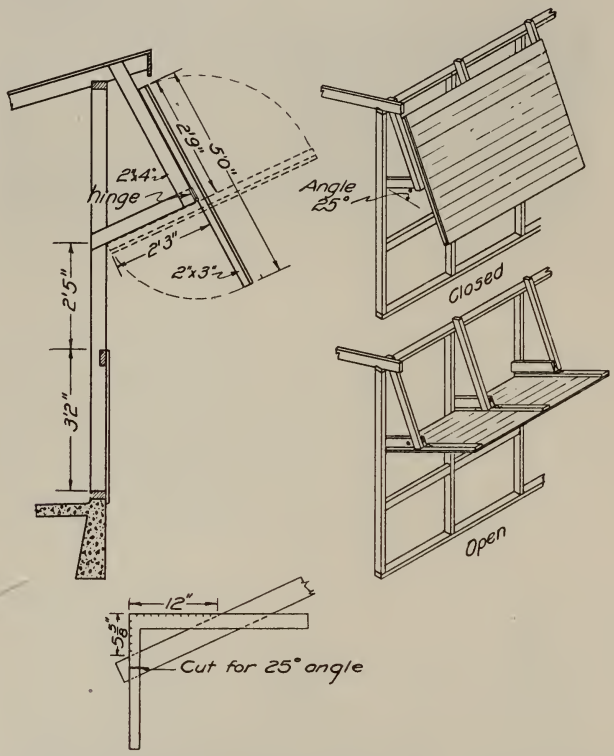


Fig. 9.—Detail showing construction of San Gabriel curtain.

With the top tipped back against the house, it serves as a sunshade or awning to shade the open front in hot weather and to keep out rain in winter. In cool dry weather the top is tipped out on sunny days so that direct sunlight can enter. A curtain of this kind would be useless in preventing rain from being blown under it into the house and wetting the interior during a driving rainstorm. It is, perhaps, less costly to maintain than the curtains shown in figures 10 and 12.

The sliding curtain shown in figure 12 may be raised or lowered to regulate the size of opening for the admission of air and direct sunlight. When raised high enough to cover all of the open front, it is storm tight. It can be operated by ropes and pulleys and the curtains

for as much as 100 feet of house can be opened or closed from one end. It will not serve, however, as a shade or awning in hot weather.

A vertically sliding curtain may also limit the vertical length of the opening. This opening cannot be greater than one-half the height

Fig. 10.—The three-purpose curtain. Some are shown held out at bottom to shade open front without restricting ventilation; others are closed down over front openings as they would be in stormy weather. In the frontispiece, these curtains are also shown with inner panels open to admit direct sunlight into house. Details of the construction of this curtain shown in figure 11.

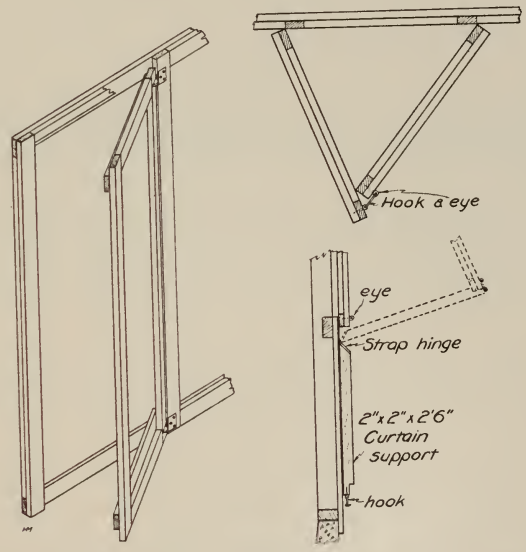


Fig. 11.—Detail showing construction of three-purpose curtain. For further details see figures 25 and 53.

of the wall if a one-piece curtain is used which will entirely close it. In the houses described in this bulletin, the opening embraces two-thirds of the height of the front wall in order to admit as much sunshine as possible; a lower opening might cause harmful floor drafts in

cool weather. The use of a sliding curtain would, therefore, curtail the vertical length of this opening unless a curtain with a drop panel were used as shown in figure 12. This latter arrangement would not reduce the amount of direct sunlight that could enter the house.

Another disadvantage of the vertically sliding curtain is that if the bottom of the curtain should reach close to the ground when

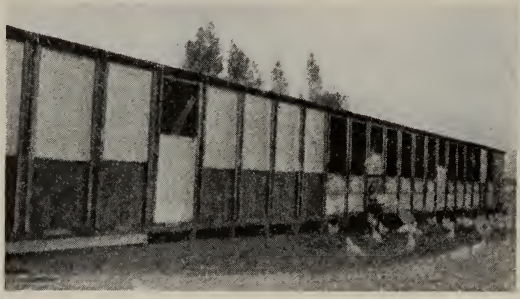


Fig. 12.—Sliding type curtains in use on a poultry house in the Santa Rosa district. Plan for the construction of this curtain shown in figure 13.

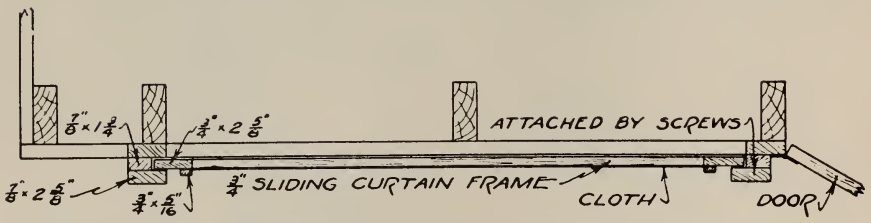


Fig. 13.—Detail showing installation of a sliding curtain. The dimensions and location of studding in above figure are shown on floor plan figure 26. The curtain frame is of simple construction. The retaining strip on one side is attached with screws as indicated so that it can be easily detached in order to remove the curtain frame.

lowered it would, unless especially protected, accumulate mud and dirt that would make the curtain unsightly and hasten the rotting of the muslin.

The three-purpose curtain shown in figure 10 was designed to provide a storm-tight covering for the open front in bad weather and shade the open front in hot weather without interfering with the entrance of ample direct sunlight when desired.

With the entire curtain extended out from the bottom as shown in figure 10 it shades the interior of the house in summer. With the hinged panels swung open (frontispiece) sunlight can enter through the entire vertical length of the open front, the shape of the opening permitting a maximum admission of sunlight. With the hinged panels

closed and the curtain fastened against the house at the bottom (figure 10) with turn buttons the front is storm and wind tight.

Both the sliding and three-purpose curtain can be closed at night in cold weather to protect the birds from raw winds, conserve the heat irradiated from their bodies and increase their comfort. A curtain however is only a mechanical device designed to do certain things, when intelligently used. It cannot be made automatic or foolproof.

The principal criticism that has been made of the three-purpose curtain is that each curtain on the poultry house must be operated individually. Poultry keepers would naturally prefer to manipulate all of the curtains on a house from one end by means of ropes, pulleys, etc. This can be done with the sliding curtain and poultrymen who live in localities where shade for the open front of the poultry house on hot days is unnecessary to keep the birds comfortable and prevent losses from heat prostration should find the sliding curtain very satisfactory. To operate a number of San Gabriel curtains together would be more difficult and no one has yet succeeded in devising a feasible means of mechanically operating the three-purpose curtain in groups to provide shade, admit sunshine or keep out storms.

In order to prolong the life of the muslin used on curtains a heavy unbleached grade should be obtained and the edges of the cloth should be treated with a waterproofing compound after being tacked in place and before the molding strips are put on.[6] The purpose of this treatment is to waterproof the cloth where it comes in contact with the wood frame. Due to an accummulation of dust in the cracks where the muslin is nailed to the frame and to the absorption of moisture by this dust, as well as by the wood, the cloth touching the frame dries out after a storm much more slowly than the rest of the muslin and if not treated rots out in a short time. It usually rots first at the bottom because of the water running down the curtain and causing the bottom strip of wood as well as the cloth to become wetter than other parts. Leaving off the bottom molding strip should cause less absorption of water and permit more rapid drying.

Glass Substitutes.—As previously pointed out the ultra-violet rays of sunlight have been found to possess properties similar to those of vitamin D in bringing about a normal utilization of the calcium and phosphorus consumed in the ration, thereby preventing rickets, aiding in the fullest production of eggs of good shell quality, and promoting

[6] A full discussion of waterproofing compounds will be found in: Holman, H. P. and T. J. Jarrell. Waterproofing and mildewproofing of cotton duck. U. S. Dept. Agr. Farmers' Bul. 1157:1–4. 1920.

health. Sunlight, however, which passes through ordinary window glass loses most of its value in this respect because window glass filters out nearly all of the beneficial ultra-violet rays. Clean, loosely woven muslin, however, probably transmits considerable solar ultra-violet light just as the manufactured paraffined cloth and other substitutes for glass do, as indicated in table 4.

The Kansas Station (1926)[7] found that 33 per cent of the ultra-violet rays in sunlight passed through medium weight muslin whereas 25 per cent passed through Cel-o-glass and only 10 per cent passed through Glass Cloth. The heavier the muslin used, however, and the more filled the pores of the cloth become with dust and dirt, the more impervious it undoubtedly is to the ultra-violet rays of the sun. Muslin is also not very durable for it tears and rots when exposed to the weather and must be replaced every two or three years.

These facts have given rise to a widespread demand for a durable substitute for glass and muslin that would prove effective over long periods in transmitting the ultra-violet rays of the sun. There are now on the market a number of these products which are being more or less extensively used and in the comparative merits of which poultry men are keenly interested.

The Bureau of Standards[8] (1928) of the United States Department of Commerce has completed tests of a number of these glass substitutes and their findings are briefly given in table 4.

TABLE 4

TOTAL TRANSMISSIONS OF VARIOUS GLASSES, WHEN NEW, FOR THE ULTRA-VIOLET, SOLAR RAYS TO WHICH COMMON WINDOW GLASS IS OPAQUE

Trade name	Per cent transmission
Fused quartz	92
Helioglass*	50
Vita glass*	50
Cel-o-glass†	20
Quartz-lite*	5
Flexo-glass‡	1
Common window glass	0 to 5

* Different brands of special glass for the transmission of ultra-violet rays.
† This consists of galvanized window screening coated with cellulose acetate.
‡ A loosely woven cloth coated with a paraffin preparation.

[7] Payne, L. F. Relative efficiency in transmitting ultra-violet light of Cel-o-glass, glass cloth, and muslin. Kansas Agr. Exp. Sta. Cir. 122:14. 1926.

[8] The ultra-violet transmission of various new glasses and window glass substitutes as compared with that of common window glass. U. S. Dept. Commerce, Bur. Standards letter-circular 235, third revision. 1928.

The Iowa Station (1928)[9] exposed chicks each day in boxes that were covered top and front with the material being tested. The time of exposure varied with the age of the chicks and with weather conditions but ranged from 11 A.M. to 2 P.M. in the first test begun in November and finished in February, and from 10 A.M. to 4 P.M. in the second test extending from February to May. A summarized tabulation of the results obtained is given in table 5.

TABLE 5

GROWTH OF CHICKS TO TEN WEEKS, AS AFFECTED BY GLASS SUBSTITUTES

Material tested	First test, Nov. to Feb.			Second test, Feb. to May		
	Average final weight in grams	Number chicks to get weak legs	Death loss	Average final weight in grams	Number chicks to get weak legs	Death loss
Direct sun	628.4	0	1	666.8	0	0
Cel-o-glass*	667.0	1	0	623.2	0	2
Screen glass*				596.8	0	4
Glass fabric†	680.6	1	2			
Glass cloth†	474.6	12	5	355.2	20	1
Flexo-glass†	708.5	1	1	580.2	0	0
Window glass	484.0	4	2	608.4	0	1

* A wire screen base coated with a cellulose compound.

† A cloth base coated with a paraffin-like substance.

Ventilation System.—In the laying houses described in these pages ventilation is provided by means of a large curtained front and openings between the rafters at front and rear walls. To guard against injurious drafts a double wall is provided back of and directly above the droppings board. This is called the hood. The part of this hood above the roosts serves to conduct the fresh air entering between the rafters at the rear to the center of the house before it can mingle with the large volume of nearly still air in the building. Without this hood cold wind rushing through the rear wall openings above the plate could strike directly down on the fowls and might chill them.

That part of the hood back of the droppings board is of no value for ventilation. Its purpose is to provide further protection against drafts should cracks open up, in the rear wall. If the rear siding is carefully laid to form a tight wall or if 2-ply roofing paper, for example, is laid directly under the siding, this part of the hood can be omitted.

The openings in the rear wall between the rafters may be covered with hinged boards to regulate ventilation or with boards that may be slipped in and out. Leaving open only one or two of these spaces in

[9] Cochran, R. L., and H. A. Bittenbender. Value of some of the glass substitutes in growing chicks. Iowa Agr. Exp. Sta. Bul. 246:169–184. 1928.

each 20-foot section in winter, may provide enough ventilation in some localities whereas in other places all should be left open. The means are thus provided to regulate ventilation as local climatic conditions and seasonal changes in the weather may require, but poultrymen must determine for themselves the most satisfactory way to regulate these openings for their region.

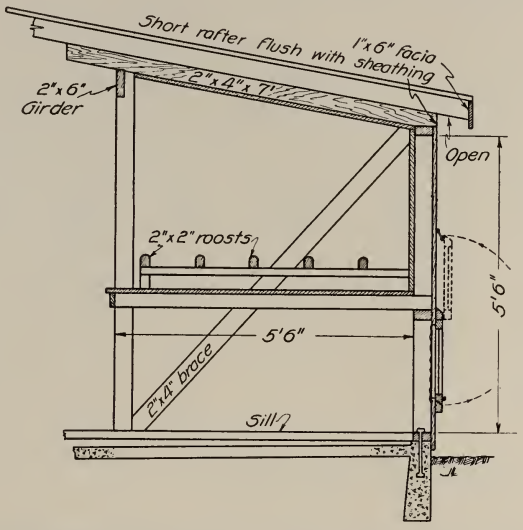


Fig. 14.—Detail showing the use of a short rafter beneath each main rafter to enlarge the space above the hood over the droppings board to eight inches, for the purpose of increasing ventilation. It has helped solve the ventilation problem in the hot interior valleys. The addition of the 2 × 4 inch short rafter slightly flattens the slope of the roof. The rear wall is not changed from that shown in figure 19. That part of the short rafter projecting over the 2 × 6 inch girder provides excellent support for the litter carrier track.

In figure 14 is illustrated a method of increasing the size of these rear openings between the rafters for the purpose of increasing the movement of air through the house on hot days. In winter these larger rear openings can also be controlled as described in the preceding paragraph.

Laying Roll Roofing.—Roofing paper is one of the most economcial materials that can be used for a poultry house roof. If a good grade of 3-ply paper is used and it is coated every two or three years with a good quality of asphalt roofing paint containing asbestos, it should last indefinitely insofar as deterioration of the paper itself is concerned The slogan: "Save the surface and you save all," applies even more forcibly to a paper roof than it does to lumber.

Laying roofing paper up and down the roof so that the strips of paper extend across the roofing boards rather than parallel to them

insures obtaining a more solid nailing of the paper. When the roofing is laid parallel to the roof boards, so many roofing nails are driven close together into one board throughout the entire length of that board that it is very apt to split and the nails are loosened. With the strips of roofing paper extending up and down the roof, the line of nails holding each lap extends across the boards and the nails are

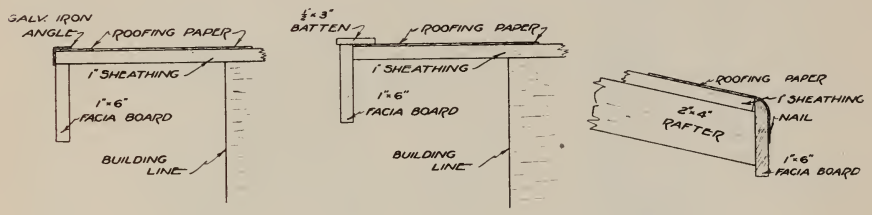


Fig. 15.—Methods of fastening roofing paper at the edges of the roof.

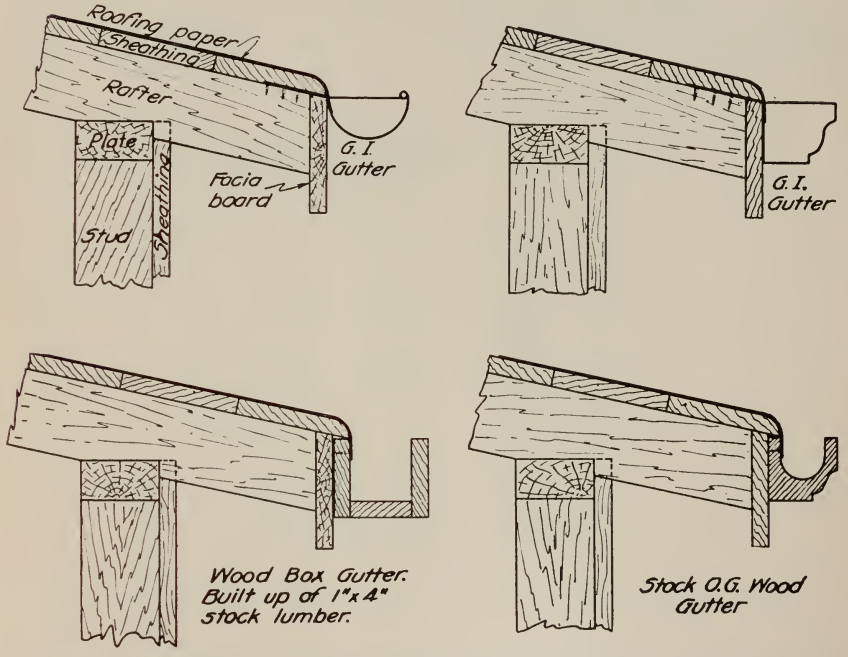


Fig. 16.—Different styles of gutters and how to install them on a shed roof poultry house.

sufficiently far apart in each board so that there is much less risk of splitting boards. The lap should be laid in the direction of the heaviest winds; then these winds will not blow against the laps and tend to tear the paper loose. Methods of fastening the roofing paper at the edges of the roof and of installing gutters are shown in figures 15 and 16.

Fowl Door—The fowl door is usually placed near the corner of each pen so that the birds can be more easily driven out of the house into a catching coop set against the outside of this door. A door opening 10 to 12 inches high and nearly as wide as the end of the catching coop should prove more convenient than a smaller opening when using the

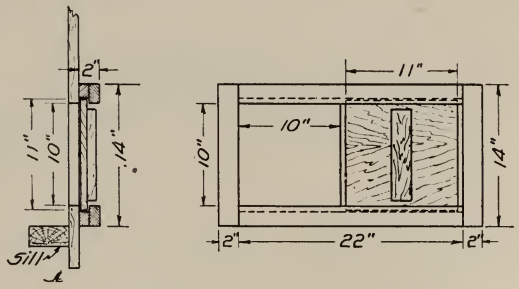


Fig. 17.—Method of constructing a fowl door that slides horizontally. A wider door than the one shown may be found more convenient when using a catching crate.

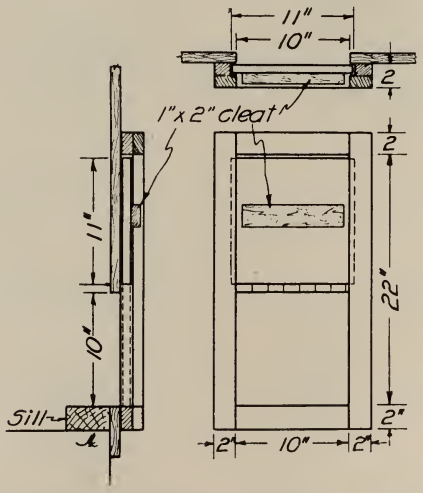


Fig. 18.—Method of constructing a fowl door that slides vertically.

coop in culling, transferring, etc. The door is made ½ inch larger all around than the opening and slides in wooden guides. A center cleat on the door keeps it from warping and serves as a hand-hold. Figures 17 and 18 show the construction of a small fowl door that slides sideways and one that slides up and down. These doors can be made any size desired.

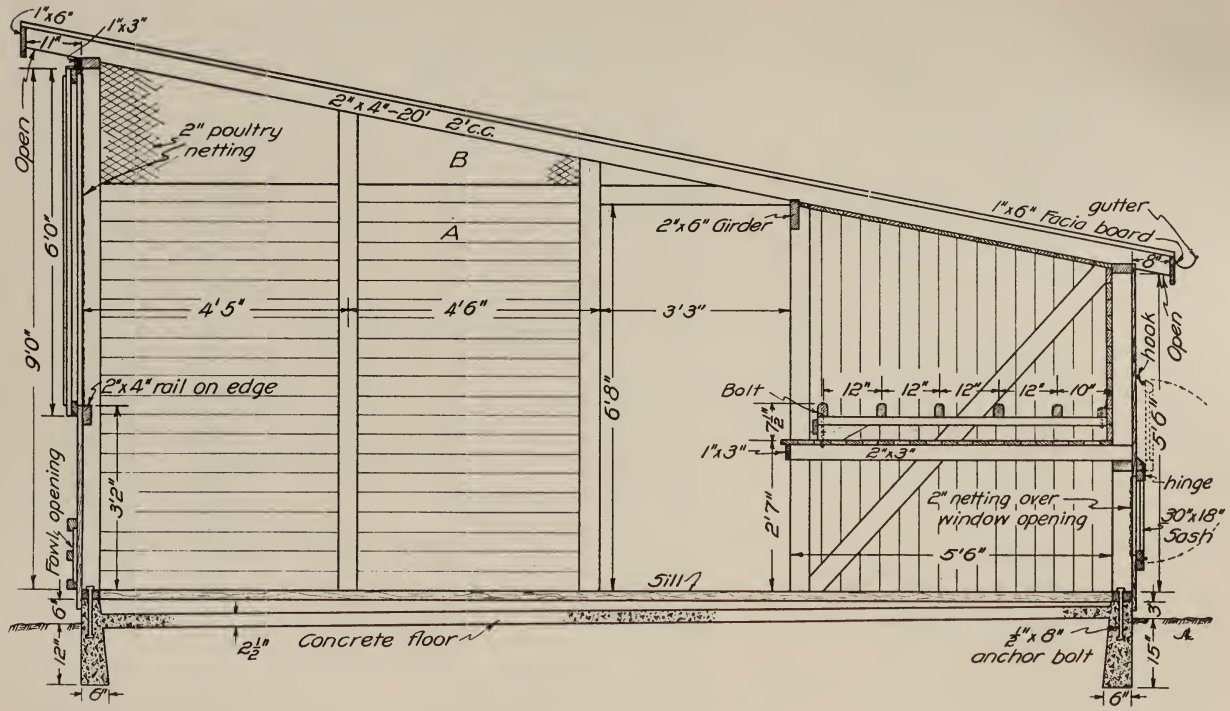


Fig. 19.—Cross section of commercial laying house through partition. Measurements not given are obtainable by subtracting known widths and thickness of materials from given measurements. *A*. Horizontal sheathing in pen partitions to door height. *B*. Two-inch poultry netting above sheathing.

COMMERCIAL LAYING HOUSE

The laying house described below has been designed to meet the requirements of poultry keepers operating on a commercial scale. It is 18 feet deep and the rear studs have been made 5½ feet long in order to raise the roof sufficiently high to provide ample head room

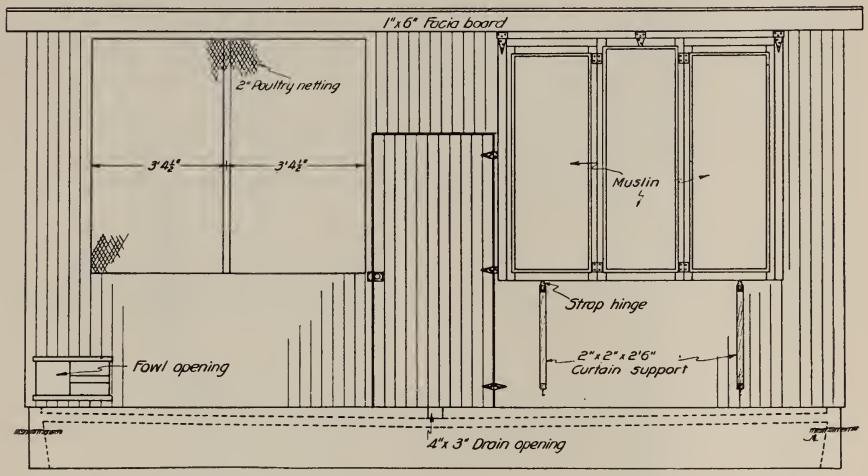


Fig. 20.—Front view of a 20-foot section of the commercial laying house. For detail plans of curtains, curtain supports, fowl door and front door see figures 25, 6, 11, 17.

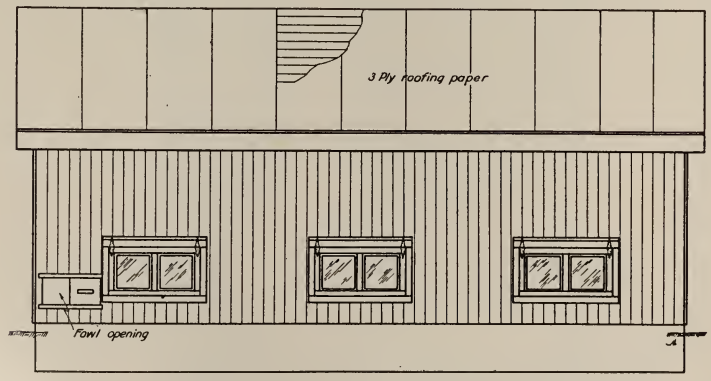


Fig. 21.—Rear view of a 20-foot unit of the commercial laying house, showing location of windows and fowl door and method of laying roofing paper. See text for discussion on rear windows and figure 17 for detail of fowl opening.

for hanging a litter carrier just in front of the droppings board (figures 19 and 22). Each partition wall has a wide, double-swing door that will allow the passage of as large a litter carrier as would

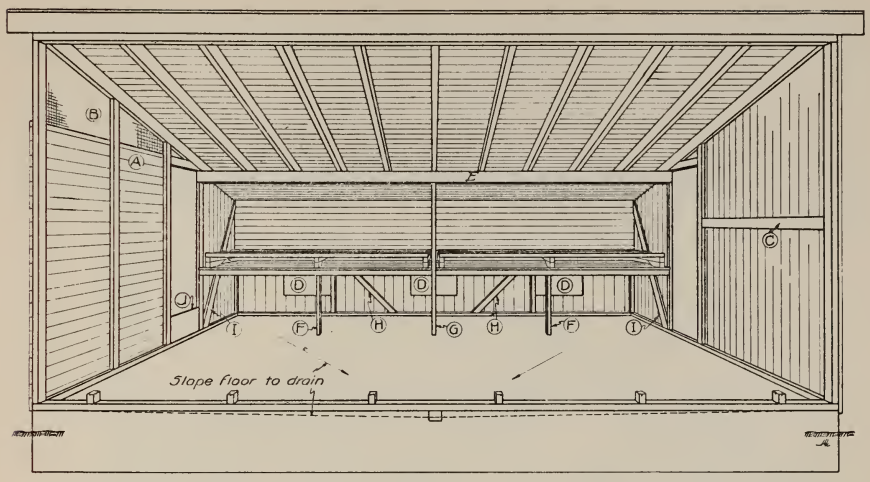


Fig. 22.—Interior view of the construction of the commercial laying house. At *A* and *B* are shown the partition construction. *A* is horizontal sheathing, *B* the 2-inch mesh poultry netting above. If side-wall nests are used the rail *C* can be dropped low enough to act as a rest for the nests and another 2 × 4 inch rail inserted above the nests. The side-wall sheathing will nail to these rails as well as to the sill and end rafter. *D* are the rear windows (see figures 21 and 7). *E* is the 2 × 6 inch girder supporting the rafters. At *F* are the front legs of the droppings board and at *G* the center support of the droppings board which extends up to support the girder *E*. At *H* and *I* are the braces in the rear wall, end wall and partition walls (see figure 23). At *J* is the removable kick board in the partition door frame over which the door swings to keep it clear of the litter.

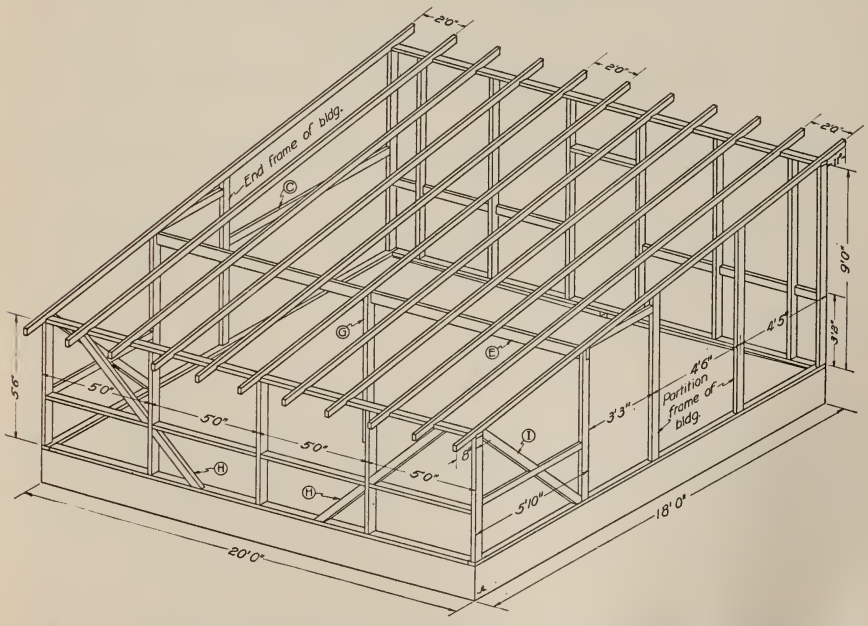


Fig. 23 Framings details of a 20-foot unit of the commercial laying house. At the right is shown the framing of a partition wall.

be desirable and is otherwise constructed as described in figure 6. The front door in each pen provides ready access to the yard to operate the curtains, remove litter, look after birds, etc

In constructing the house with pens forty feet long a change is necessary in the framing of the front wall. This is shown in figure 27. All other dimensions remain the same as for the house with 20-foot sections, shown in figure 26.

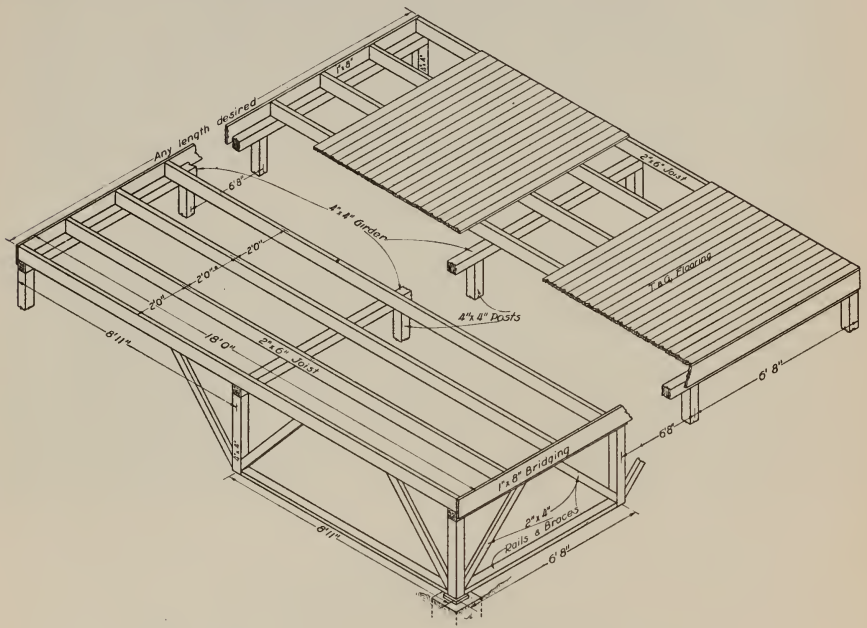


Fig. 24.—This method of constructing foundation and floor is used where the ground slopes so much that a concrete foundation and floor would be too costly.

Particular attention is called to the slope of the concrete floor as shown in figures 19 and 26. A concrete floor with a decided slope to drains in the front wall greatly facilitates scrubbing and hosing out the house.

FARM POULTRY HOUSE

The farm poultry house has been designed to most economically meet the needs of the farm flock (figures 28–32). It differs from the commercial poultry house previously described in that it is 16 feet deep, instead of 18 feet and the roof is one foot lower. A litter carrier is usually not used in a farm poultry house because it is not long enough to need it and the lower walls will, therefore, reduce the cost of construction and still allow ample head room.

The doors have been placed in the end walls near the front in order to obtain head room. There is no front door as it is not needed in a one or two-unit house and a poultry keeper wishing a larger house would probably prefer the commercial laying house. The plans

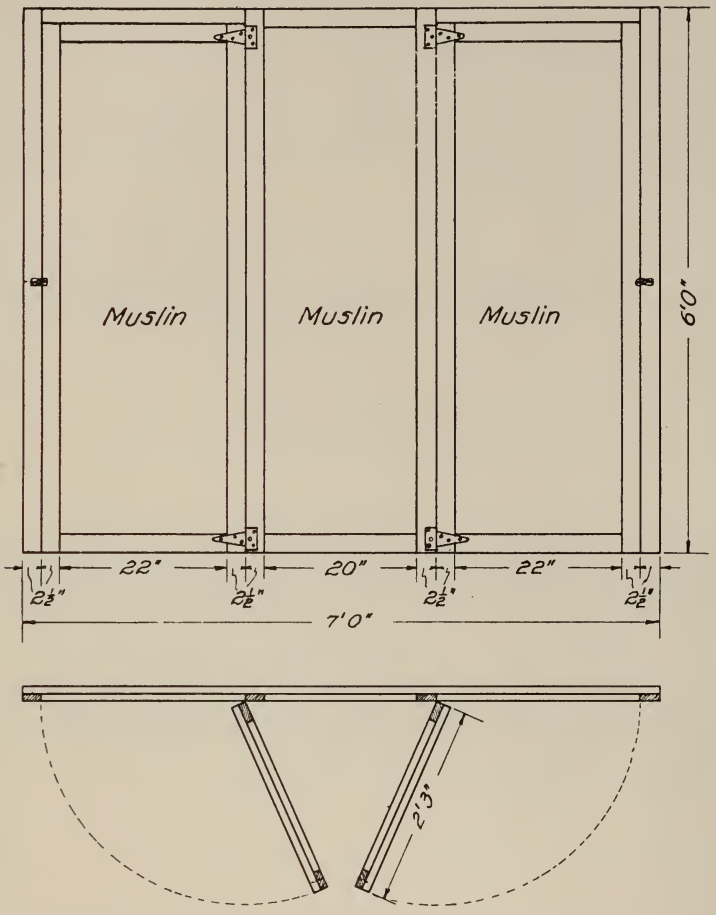


Fig. 25.—Detail of curtain for commercial laying house. For further construction details see figure 11.

(figures 28–31) show one 16 × 20 foot unit of house having a normal capacity of 128 laying hens, and figure 32 shows a combination glass and curtain front. The material list provides for the building of as many units as desired.

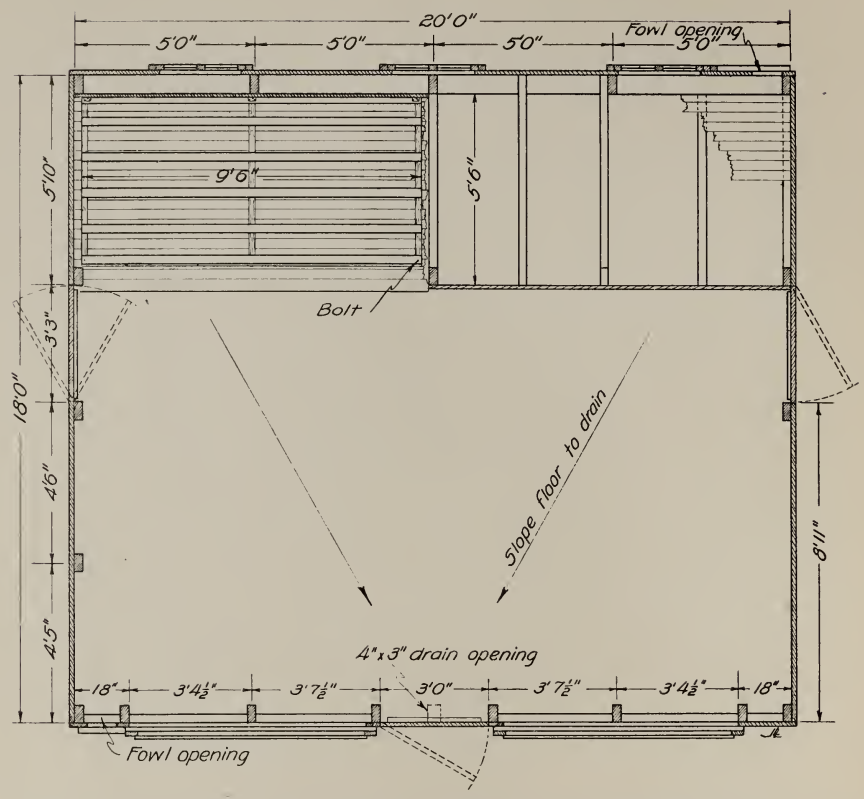


Fig. 26.—Floor plan of one 20-foot section of the commercial laying house. The floor drains from all sides to drain opening in front foundation wall. At left is shown the partition construction and at right the end wall construction. Only one section is shown as all the sections of any length of house would be alike. See text for discussion of floor and foundation.

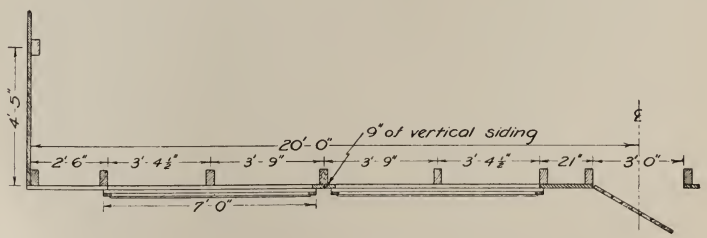


Fig. 27.—Recommended changes in the front wall framing and changes in the location of the curtains when only one front door is desired in each 40-foot unit.

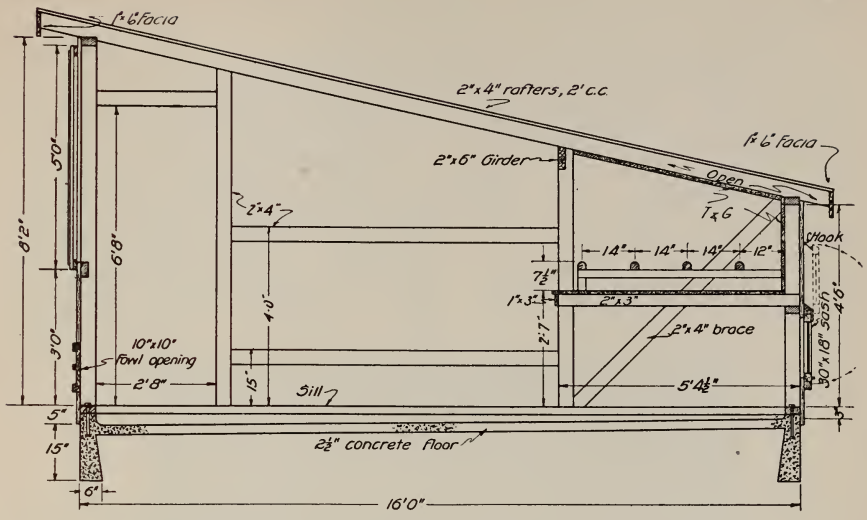


Fig. 28.—Cross section of the farm poultry house.

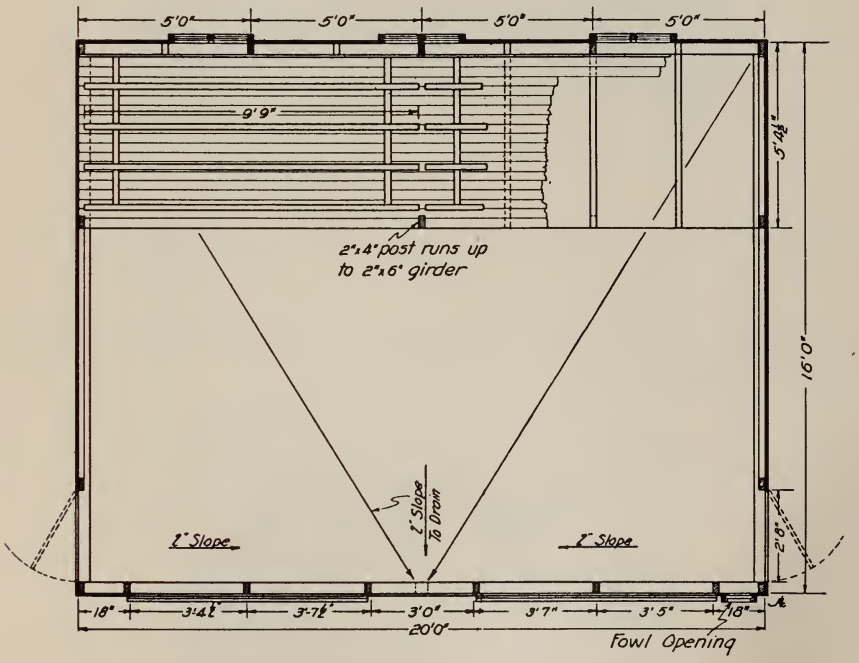


Fig. 29.—Floor plan of the farm poultry house.

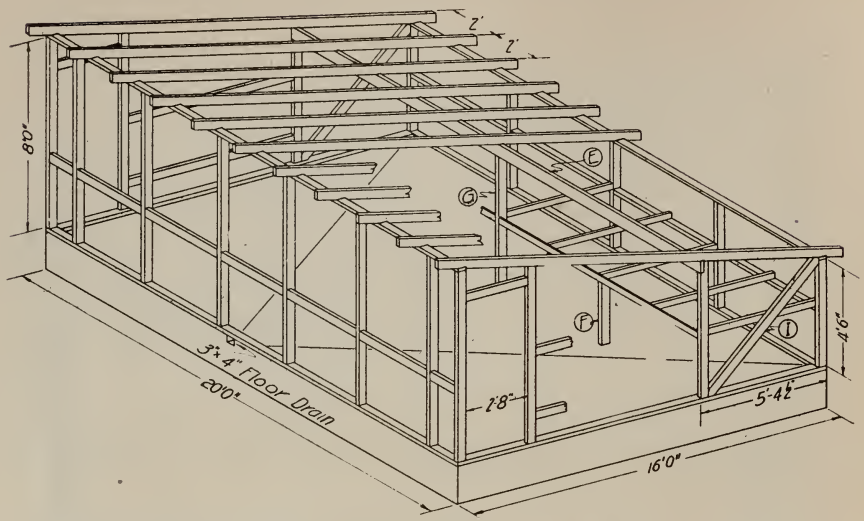


Fig. 30.—Framing detail of farm poultry house, *E*, 2 × 6 inch girder, support for rafters. *F*, 2 × 4 inch leg supporting front of droppings board. *G*, 2 × 4 inch post supporting front of droppings board and continuing up to support 2 × 6 inch girder. *I*, 2 × 4 inch end bracing.

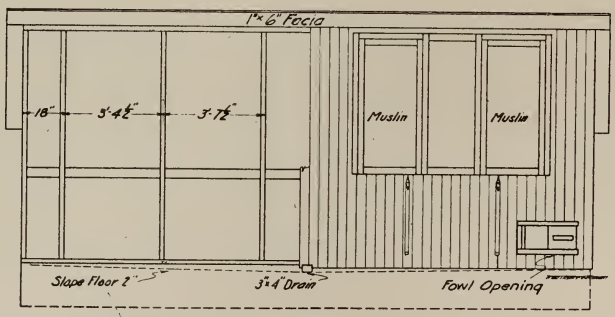


Fig. 31.—Front elevation of farm poultry house. At left is shown framing; at right the completed front. The location of rear windows for this house, and method of laying roofing paper are shown in figure 21.

Fig. 32.—A farm poultry house showing sash and curtain front.

KNOCK-DOWN COLONY HOUSE

The knock-down house (figures 33–40) was originally designed for the man living in town or in the suburbs who wished to keep a pen of fowls in his back yard to supply his family with fresh eggs and to profitably utilize table scraps. The knock-down construction makes it easy to move. The family living on rented property in town can move hen house and chickens along with the household goods and not be prevented from keeping chickens because of not wanting to erect a permanent henhouse on rented land. Being only 8 × 8 feet in size, it

Fig. 33.—Knock-down poultry house and run as used for special matings of breeding fowls on a poultry farm in northern California.

is readily set up or knocked down by the insertion or removal of three bolts at each corner, yet it will accommodate 18 Leghorns on the basis of 3½ square feet of floor space per bird.

The portable run shown in figure 34, is covered to prevent the chickens from flying over the fence into the garden or into the neighbor's yard. It is large enough to supply the birds with sufficient outdoor air and sunshine to keep them healthy. There are fowl doors on three sides of the house so that the run can be moved to fresh ground every week. Assuming that the man in town would have only Saturday afternoon or Sunday to devote to his chickens, he could move the run to fresh ground each week end. The first week it would be placed on one side of the house; the second week it would be moved around to the front of the house and the space vacated spaded and sown to some quick-growing greens; the third week it would be moved to the other side and the used ground spaded and sown; the fourth week it would be moved back to its original location and the process continued each succeeding week. By this method the ground

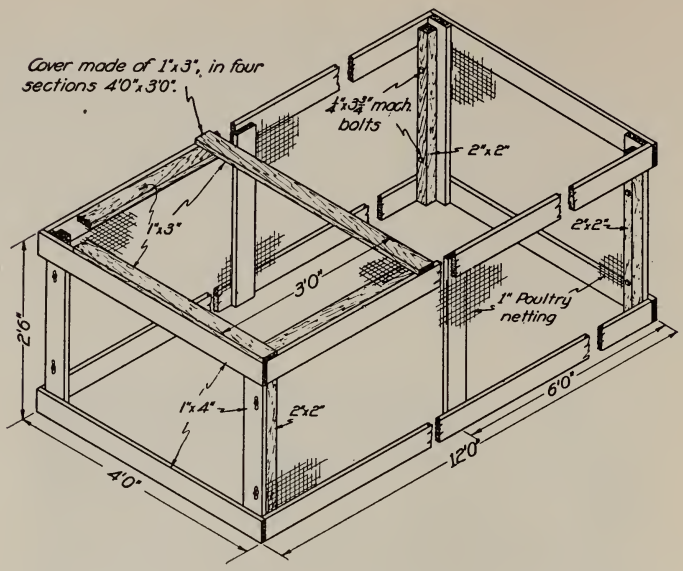


Fig. 34.—Plan for the construction of the knock-down run to be used in connection with the 8 × 8 foot knock-down poultry house.

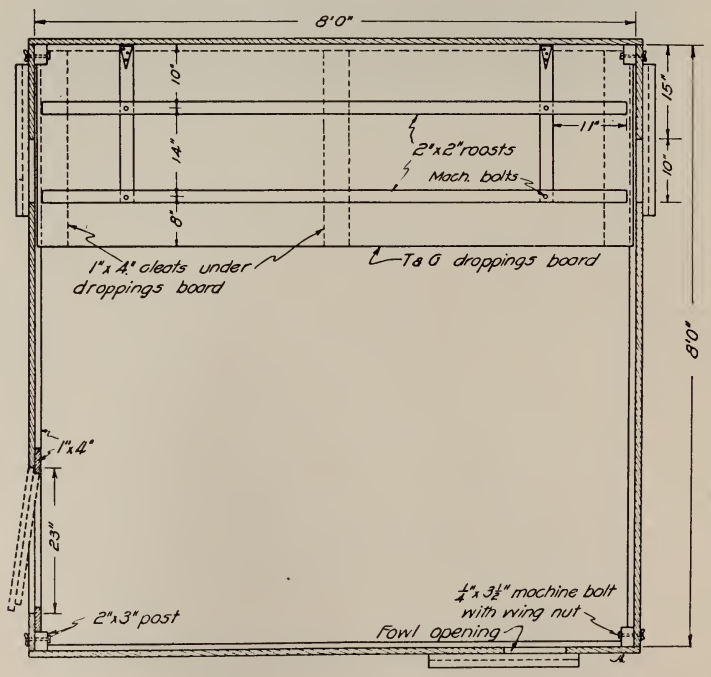


Fig. 35.—Floor plan of 8 × 8 foot knock-down poultry house showing how ends are bolted together.

could be kept reasonably fresh and clean with two or three top dressings of lime a year and a nice family flock kept in a space 35 × 20 feet.

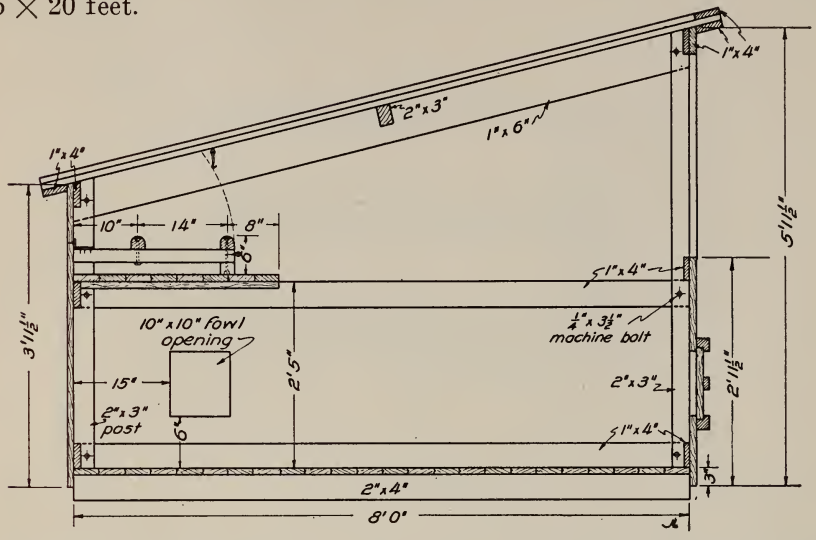


Fig. 36.—Cross section of 8 × 8 foot knock-down poultry house showing how the side walls are constructed and how the 2 × 3 inch center roof support fits into openings cut into the side walls to receive it.

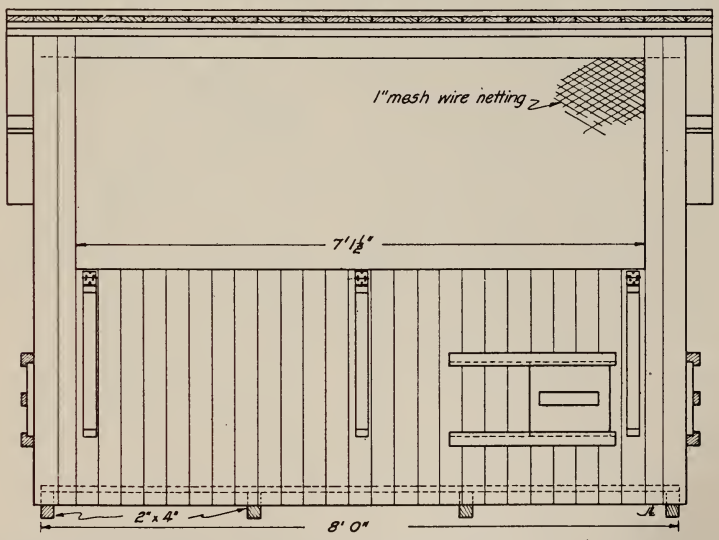


Fig. 37.—View showing front wall construction of 8 × 8 foot knock-down poultry house. The construction of the curtain is shown in figure 40.

The wooden floor in this house does not accumulate contamination like a dirt floor. The roof can be raised two or three inches at the rear in hot weather to make the house cooler. The whole house can be raised a foot above the ground on blocks in summer to supply shade.

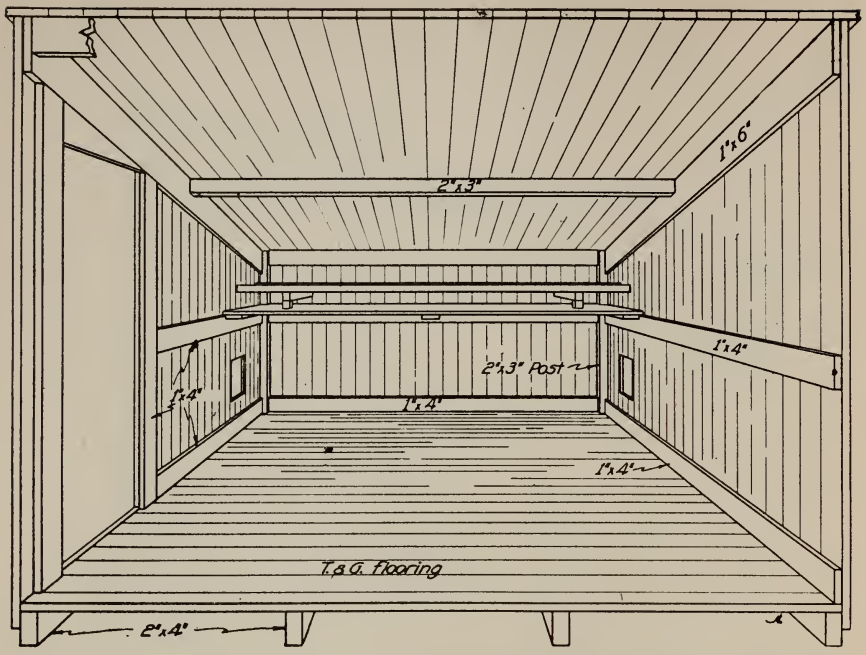


Fig. 38.—Interior view of 8 × 8 foot knock-down poultry house showing framing details.

Although originally designed for back yard use, it has proven very useful as a colony brooder house, as a colony house for young stock on range and as a colony breeding house for special matings. The colony system of rearing chickens requires no fencing which would interfere with plowing and irrigating in cropped fields or orchards and is, therefore, a very convenient system to use under such conditions. The growing stock have free range. They can pick up a large part of their feed in the fields and the houses can be moved to new ground each year.

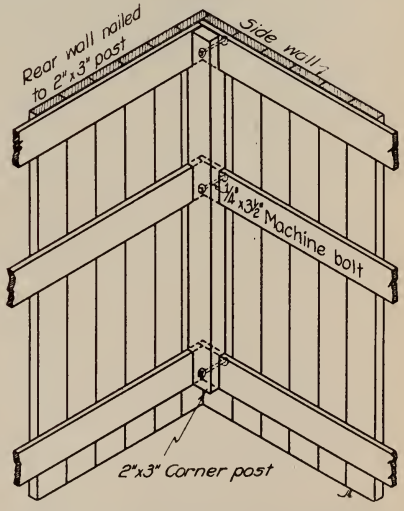


Fig. 39.—Detail plan showing the method of constructing the corners of the 8 × 8 foot knock-down poultry house.

When used for brooding and rearing on range, the portable run, figure 34, is employed to confine each flock of chicks for a few weeks

and teach them to know their own quarters. If the houses are spaced 80 to 100 feet apart little difficulty will be experienced with birds from one house mixing with the birds in other houses when they are allowed to run together.

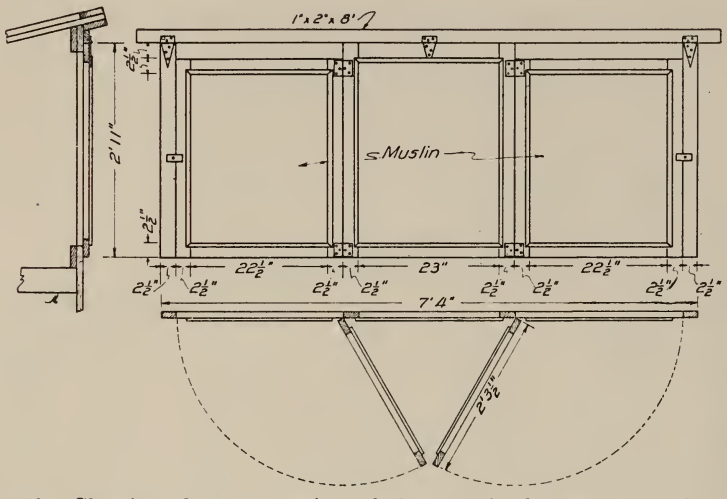


Fig. 40.—Showing the construction of the curtain for the 8 × 8 foot knock-down poultry house.

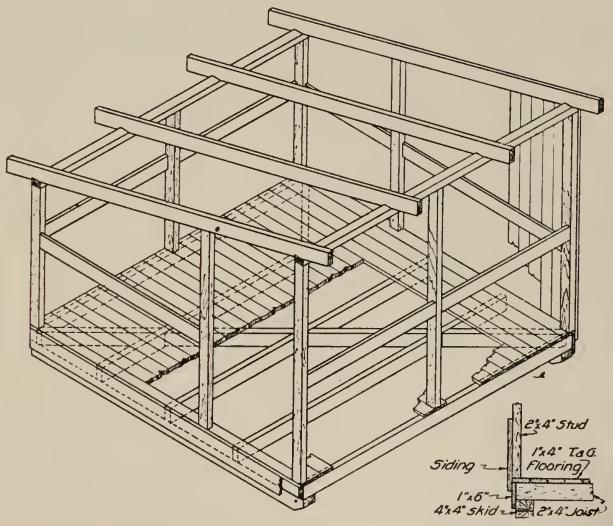


Fig. 41.—Showing method of framing 8 × 8 foot poultry house if it is to be built permanently on skids instead of using knock-down construction.

The farmer or poultry keeper who has a tractor or teams of horses may prefer to build portable houses on skids and pull them from place to place rather than use the knock-down construction. The framing details for a portable house on skids are shown in figure 41.

BREEDING HOUSE

The poultry breeder has need of small pens to take care of matings in which only one or two males are used. The breeding house shown in the accompanying figures has been designed for that purpose and may be built any length desired (figures 42 and 43). The pens in the house are 12 feet deep and 10 feet wide with two roosts which will

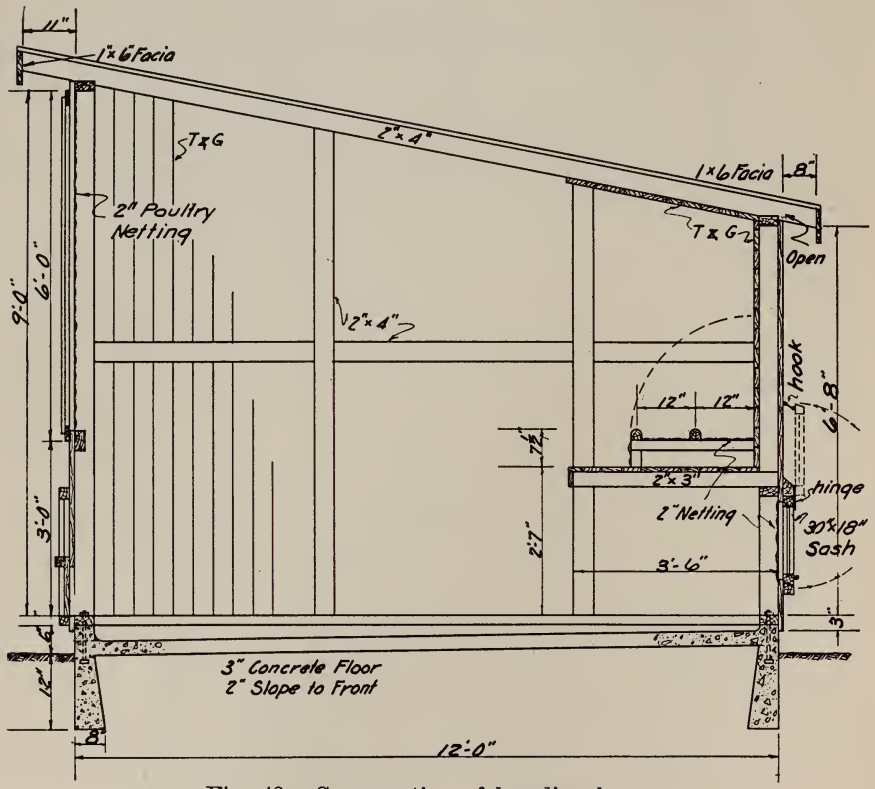


Fig. 42.—Cross section of breeding house.

accommodate 22 birds on the basis of 8 linear inches of roosting space per bird. It would not be considered feasible to allow so much floor space per bird for market egg layers but in the case of choice breeding hens that are being trapnested and pedigreed, such roomy pens are justified.

A very desirable feature of this house, which is made possible by the small number of birds kept in each pen in proportion to its size, is the series of rear entrance doors (figure 44). A rear entrance to trapnest pens is very convenient and saves time because of the fre-

quency with which such pens must be visited each day. With doors in the partitions between pens there is always danger of a bird slipping through from one pen to the next when a door is opened and not being noticed by the poultryman. The result is that mis-matings

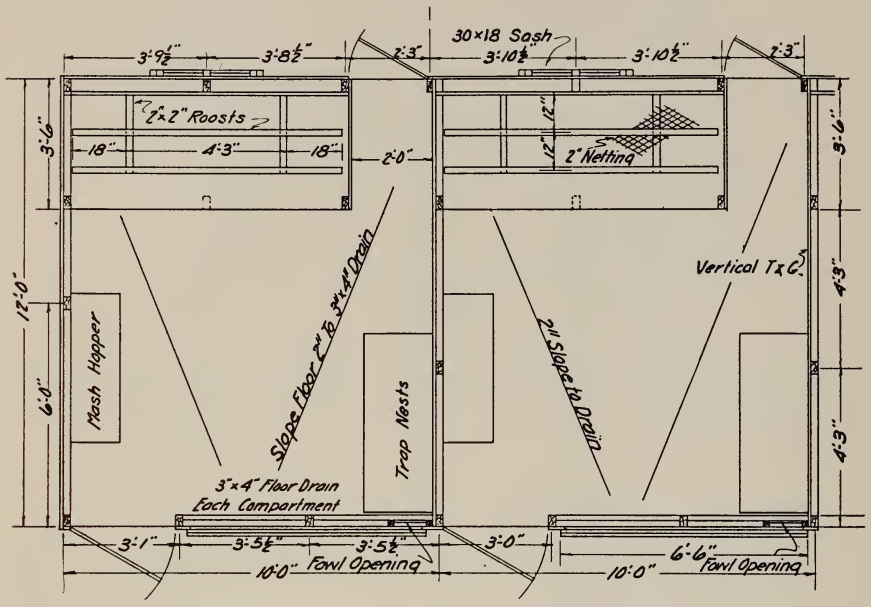


Fig. 43.—Floor plan of breeding house showing arrangement of doors, roosts, curtains, nests, etc.

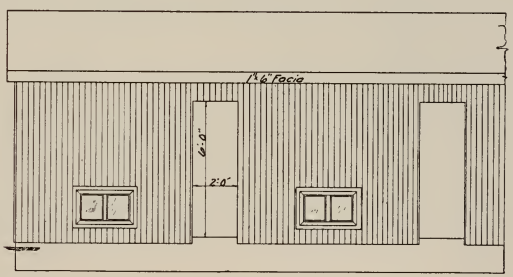


Fig. 44.—Rear view of breeding house showing location of rear windows and doors. See text for discussion of windows.

occur, hatching eggs must be discarded and errors may creep into the pedigree records. The front door (figure 45) in each pen provides ready access to the yard to operate the muslin curtains as required or to look after the birds there.

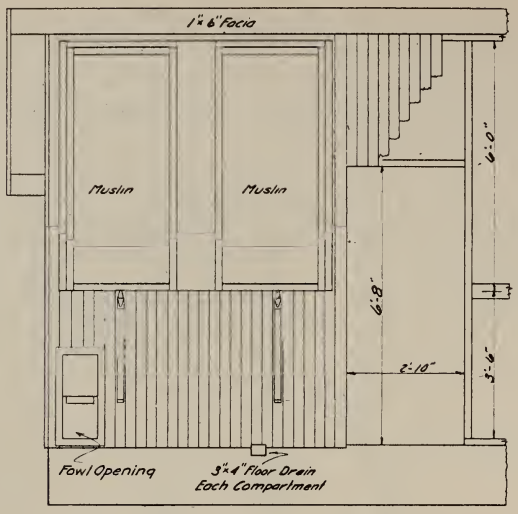


Fig. 45.—Showing front wall construction of breeding house. See figure 50 for curtain dimensions. Figure 11 illustrates the construction of the outside doors.

COMMERCIAL BROODER HOUSE

It is true that chicks can be brooded in either a commercial laying house, or farm poultry house. They can also be brooded in one end of a barn, if it is properly fixed for the purpose, or in almost any outbuilding that is sufficiently warm and light. In fact poultry keepers just starting into the business may find it advisable to use their laying houses and other available buildings for brooding until such time as they are needed for other purposes.

In building up the laying flock to the size desired, laying houses must be built in advance of the stock being reared to fill them so that they can be used to brood the stock that is later to occupy them as layers. The poultryman can, therefore, postpone investment in a special brooder house until after all of the laying houses have been built.

When a poultry keeper builds a brooder house, however, it should be of such design as will prove not only most efficient in the saving of labor but also in enabling him to obtain the maximum results of which he is capable in rearing the chicks put into it. The brooder house shown in figures 46–50 has been designed to meet these requirements.

An alleyway at the rear is provided as it is one of the most convenient and labor-saving features that can be incorporated into a long brooder house and is, therefore, worth many times its cost. In a

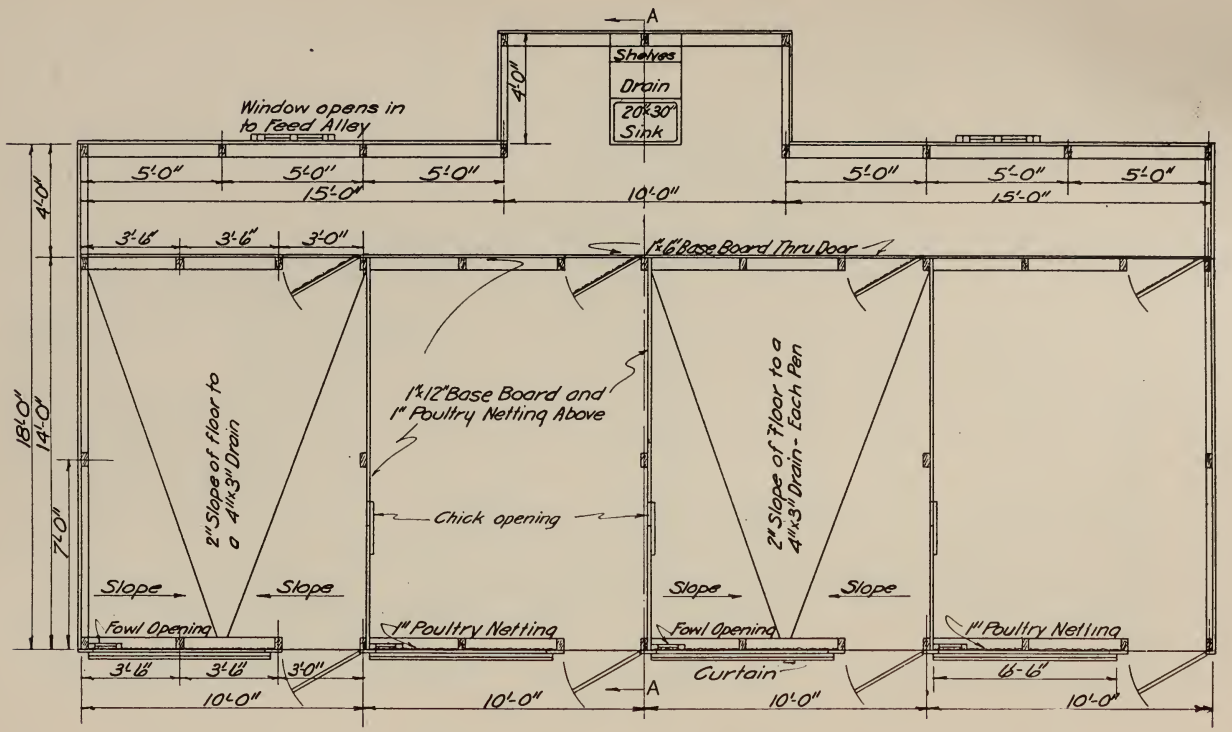


Fig. 46.—Floor plan of brooder house showing four pens 10 × 14 feet, the alleyway at the rear of pens, and an extension in which is located a sink for washing utensils and storage space for chick feed and litter.

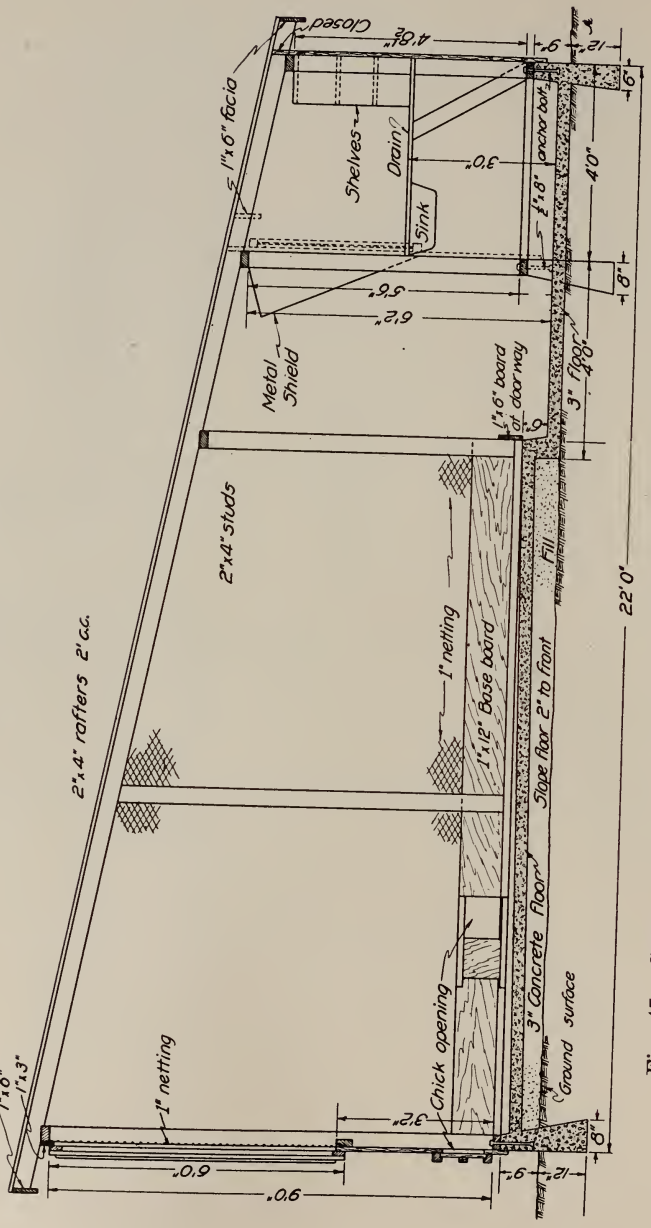


Fig. 47.—Cross section of brooder house showing construction of the pen partitions.

house with an alleyway as compared to one without it, (1) more frequent trips will usually be made through the house to look at the chicks because such trips can be made with less trouble; this closer supervision will aid materially in reducing losses from toe-picking,

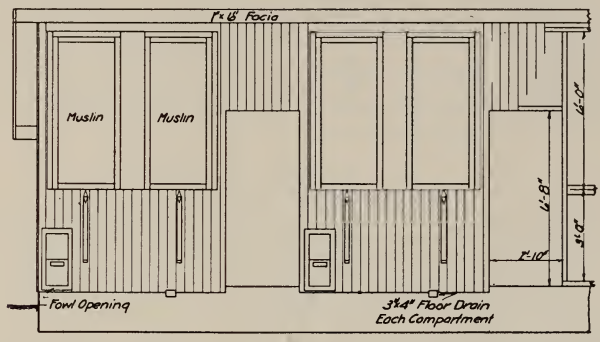


Fig. 48.—Front elevation of one 20-foot unit of brooder house.

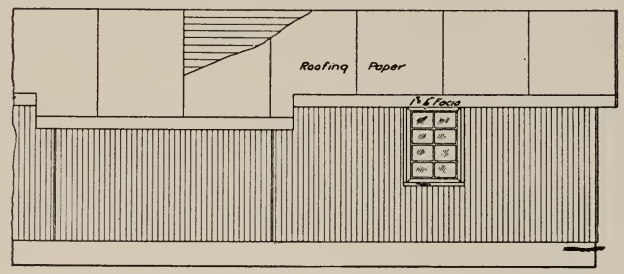


Fig. 49.—Rear elevation of brooder house showing extension of roof over supply and utensil room.

accidents, and disease; (2) feeding and watering can be done more expeditiously; (3) cleaning can be more easily taken care of because any pen may be cleaned without going through or disturbing any other pen.

Data compiled by this Station (tables 6 and 7) have shown that as the number of chicks brooded together in a pen is increased or floor area per chick decreased, other things being equal, mortality increases. Extended observations indicate that the majority of poultry keepers will obtain most profitable results in brooding chicks in lots of not more than 300.

The brooder pens have therefore been made 14 feet deep and 10 feet wide with a capacity of 280 chicks on the basis of ½ square foot of floor space per chick. Thus in a house 18 feet deep is provided an alleyway of ample width, and pens large enough to accommodate

TABLE 6

MORTALITY OF CHICKS AS AFFECTED BY THE NUMBER BROODED TOGETHER*

Number of chicks per unit	Number of units	Average number of chicks	Per cent mortality
100– 400	7	231	15.4
400– 800	12	717	14.2
800– 1200	22	1012	18.3
1200–1400	9	1309	20.9

TABLE 7

DEATH RATE OF CHICKS AS AFFECTED BY FLOOR AREA ALLOWED

Floor area per 100 chicks	Number of chicks	Chicks died	Per cent died
35 sq. ft. or less	73,077	19,254	26.3
35–50 sq. ft.	25,371	4,122	16.2
50 sq. ft. or more	25,044	3,484	13.1

* These tables give the summarized results obtained in a brooding survey made by the Division of Agricultural Extension of the University of California and embracing a total of 312,295 chicks.

flocks of such size as should prove most satisfactory in the hands of the majority of poultry raisers. For those wishing to brood in larger groups than 280, some of the partitions can be omitted and two or three pens thrown together. But the smaller pens should prove more satisfactory and they will be found very convenient in separating the sexes at an early age.

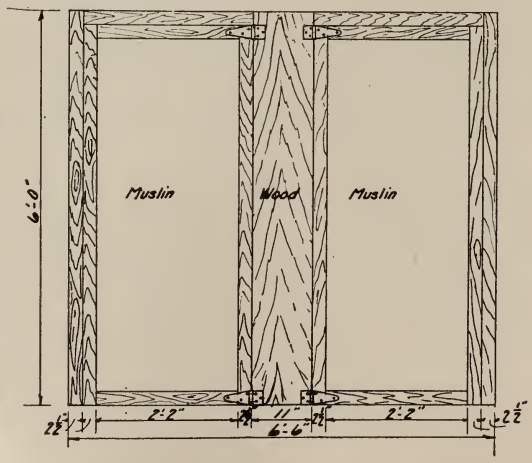


Fig. 50.—Detail of curtain for brooder house. A center wood panel is substituted for the muslin panel in this curtain. For construction see figure 11.

Head room is obtained in the alleyway by lowering the floor six inches below the floor level of the pens. Windows in the rear wall provide both light and ventilation. They open inward from the top and have side shields as shown in figure 47, which help prevent drafts.

In the center of each 40-foot section there is a recess off the alleyway. This recess contains a sink for washing water vessels and utensils and a set of shelves. It is large enough to hold a bale of straw, a sack of sand and two or three bins for grain and mash.

HOSPITAL FOR FOWLS

A hospital for sick birds might be called a necessary inconvenience on a poultry plant. Good management requires that sick birds be separated from the well ones because of the danger of spreading infectious disease. The well birds also pick on and more or less abuse the sick ones and won't allow them to get enough to eat and drink. If ailing birds are to be treated and given a chance to get well, their

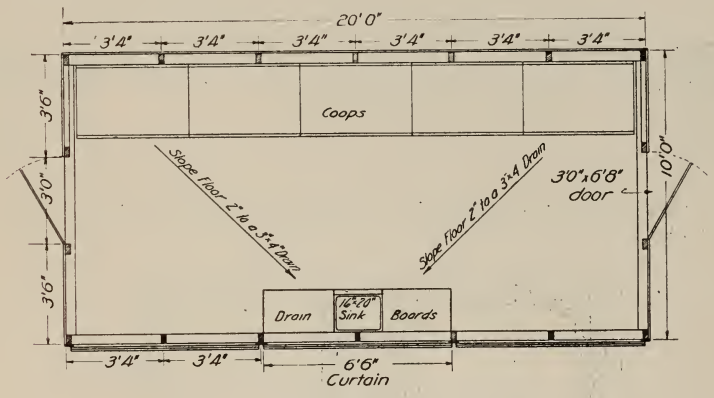


Fig. 51.—Floor plan of hospital.

hospital quarters should promote recovery insofar as environment can do so. The hospital described here is a simple shed roof house (figures 51–54) with well drained concrete floor that can be hosed out and kept sanitary. The large open front will admit abundant health-promoting sunshine but is well protected by curtains against bad weather. Roomy, sanitary coops for the birds facilitate catching individual birds for treatment and a sink is provided as well as table space. The coops can be tiered three high to accommodate 45 birds in a house 20 feet long and floor pens for convalescent birds not requiring frequent individual treatment can be built on each side of the sink, if desired.

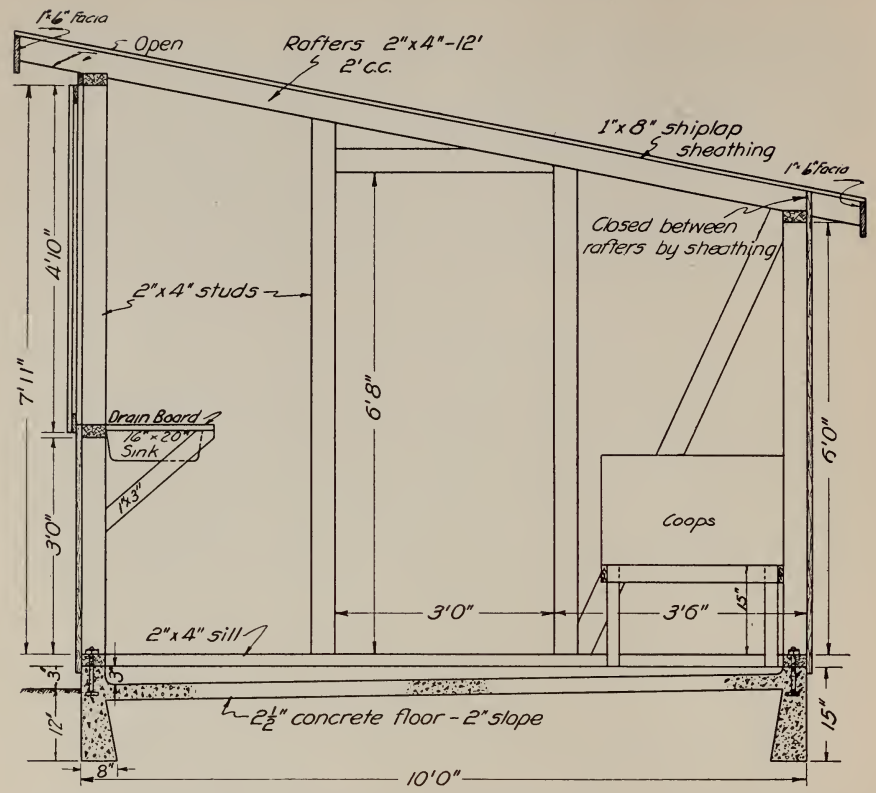


Fig. 52.—Cross section of hospital. Construction of this building is similar to that of the laying houses described on previous pages.

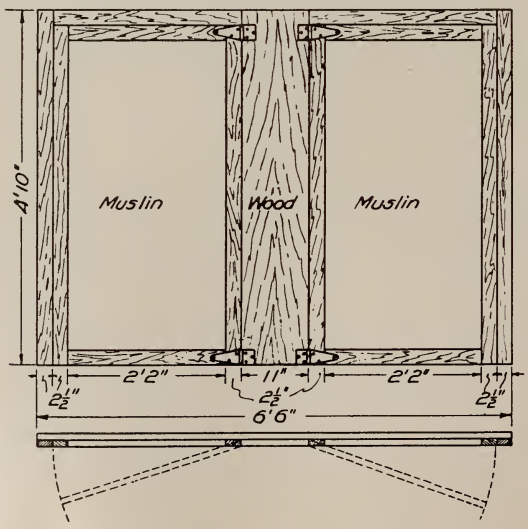


Fig. 53.—Measurements for curtain shown in figure 54. The operation of this curtain is discussed in previous pages.

In figure 51 is shown the location of the coops. Very satisfactory and comparatively inexpensive hospital coops can be made from the all metal exhibition coops used at poultry shows by providing them with one-inch mesh wire bottoms having shallow trays or pans below. The wire mesh will keep the birds away from the droppings and the sliding trays will facilitate cleaning. Coops with trays to catch the droppings can be arranged in tiers.

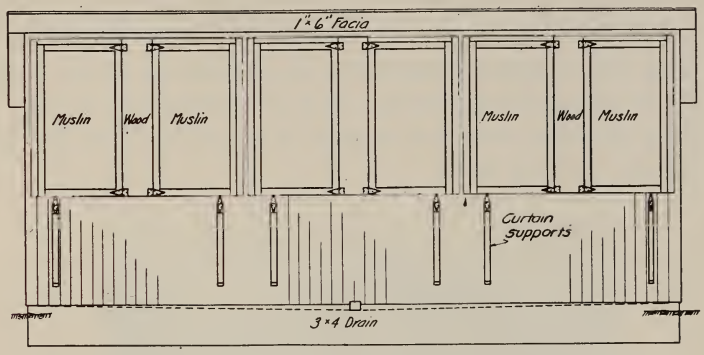


Fig. 54.—Front elevation of hospital showing curtain front.

FEED ROOMS

The arrangement and size of feed rooms and feed storage space are matters which must be governed by the objects to be attained and the layout of the poultry plant. For example, one man may prefer a very long laying house with a small feed and work room in the center of each house. This room is designed to care for a two weeks' supply of feed for that house and provide space for packing eggs and for appliances including a litter carrier. Another favors a two-story structure in the center of each long laying house, (figure 10). He wants storage space for enough straw and certain grains, such as barley, to last from harvest to harvest. Yet a third man chooses to arrange his plant with only moderately long laying houses on each side of a central road; and a small feed room similar to the first one mentioned above is placed on the end of each laying house adjacent to the road (figure 55). Also, where small feed rooms are attached to each laying house and additional feed and straw storage is required, a large central building is erected. On other farms, all feed is kept in one centrally located building and no feed rooms used in connection with the laying houses.

The relative merits of these arrangements for any particular farm will depend on the conditions existing in the area in which that farm

is located. Poultrymen in certain parts of the Sacramento Valley may be able to buy barley, wheat and straw in most years at low enough prices, following the harvest, to return them a profit after adding all carrying charges, as compared with what equivalent grain would cost them if purchased as needed from month to month. But poultrymen in another locality might find month-to-month buying the cheaper. Interest, depreciation and insurance charges on the storage buildings, interest and insurance on the material stored, depreciation in grain and sacks from rats, are items that must be considered in determining the economic feasibility of purchasing grain and straw on a long or short storage basis. And such data will in turn aid in determining the most economic method of handling these materials on any particular poultry farm.

Fig. 55.—University type laying house containing five 40-foot sections and a 12-foot feed room at one end.

But irrespective of whether feed and straw are purchased to meet one's needs for a number of months or for only a week or two, the buildings and rooms should be made as rat and mouse proof as possible. The economic losses occasioned by these pests and the menace of their presence through their disease-bearing potentialities amply warrant every effort to eliminate them from one's premises.

It is with these ideas in mind that the following discussion and illustrative material are presented. The purchase and distribution of feed on a poultry farm is a problem with so many factors entering in that one cannot do more here than offer such suggestions and ideas as will enable a poultry keeper to better appreciate that problem and build more effectively than he would otherwise do.

A plan and cross section of a one-story feed and egg room, 20 × 20 feet in size, are shown in figures 56 and 57. The floor plan shows three doors. Those opposite each other are intended to line up with the doors of the laying house and to provide continuous track and passageway for the litter carrier through the feed and egg room, to the laying pens on each side, when the room is located in the center as in

figure 10. Only two doors would be needed if the feed room were at the end of the laying house; and only one, perhaps, if constructed as a separate building.

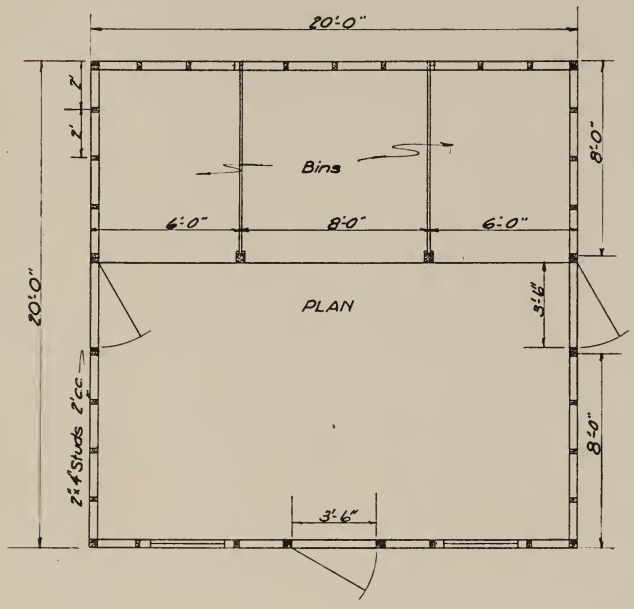


Fig. 56.—Floor plan of one-story, feed storage and egg room.

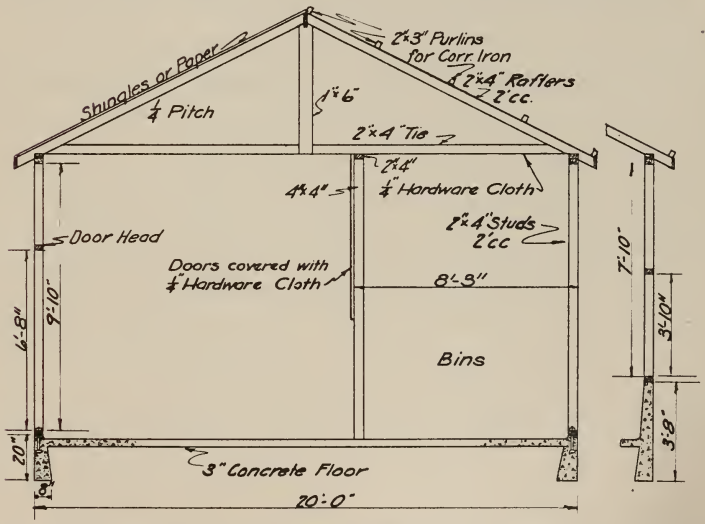


Fig. 57.—Cross section of feed storage and egg room shown in figure 56.

The feed and egg room should be centrally located in relation to the stock fed and on a well graveled driveway that will permit heavy trucking. Such a location facilitates the delivery of feed both in

winter and summer, and reduces the distance traveled in feeding the fowls and gathering eggs.

The three bins (figure 56) provide considerable space for sacked or bulk feed. For example, the two bins 6 × 8 feet in size will hold 6 tons[10] each of sacked grain[11] if piled eight feet high or an equal amount of grain in bulk when piled to a height of only four feet. The large center bin, 8 × 8 feet in size, will hold nearly eight tons of sacked grain piled eight feet high. Since mash is usually more bulky than grain, the mash capacity of these bins would be less than for grain. If used to maximum capacity for storage purposes the three bins are large enough to hold one year's supply[12] of grain for a 2,000-bird flock.

The area forward of the bins should prove large enough to accommodate at least a ton of mash, a green feed cutter, egg packing tables and minor equipment.

The details of construction should be given special attention when a large amount of feed is to be stored. The floor should be well above grade to insure a dry storage area at all times. The studding and side wall sheathing must be very securely nailed in place using sufficient ties to hold the framing in alignment and to withstand such side pressure as may be exerted against the walls by the sacked or bulk grain. The bins should be ceiled tightly on the inside if the grain is stored in bulk.

To make these bins rat and mouse proof they may have to be lined with galvanized iron and completely enclosed. Removable panels or frames covered with ¼-inch mesh hardware cloth (figure 57) can be inserted to enclose the top and front of each bin.

For commercial poultry farms having a large tonnage of grain in storage it may prove most economical to store in bulk in overhead bins with the ground floor available for grinding and mixing machines. On any but very large farms, however, it is questionable if the very much heavier and more costly construction required for bulk storage of grain in overhead bins would be compensated for by the greater convenience of such construction as compared with bins on the ground.

Scratch litter, such as baled straw, shavings, rice hulls, etc., should not be stored in quantity in the same building with feed because of the fire hazard and also because of the difficulty of keeping

[10] A space 3 x 4 feet on the floor and 5½ feet high = space required for one ton sacked grain.

[11] Estimating 100 pounds to the sack.

[12] Estimating 10 pounds of grain and 10 pounds of mash for each 100 fowls per day.

stored liter free from rats and mice. A shed or barn sided and roofed with corrugated iron and somewhat isolated from the other buildings in order to minimize the fire risk is desirable for litter storage. If a shed, it should face away from the prevailing direction of driving rainstorms. Baled straw, or sacks of rice hulls or other litter material in bales or sacks, should be piled on a slatted platform at least one foot above the floor. If possible, the piles should be narrow with aisles between. This reduces the protection afforded rats and gives dogs and cats a better chance to prey on them.

YARDS FOR POULTRY

The relative merits of continuously confining laying and breeding hens to the laying houses as against allowing them out-of-doors represents a problem that has become of increasing economic interest in California in recent years. This is due to the expansion of the poultry industry from a side issue on the farm to a highly specialized type of farming of major importance and to rapidly rising land values, particularly near the larger cities. Poultry products, like dairy products, are perishable and must be marketed frequently, expeditiously and at low cost if the enterprise is to prove profitable. Those areas, therefore, most favorably situated as regards good roads, railroad facilities and proximity to good markets are most desirable.

Rising land values necessitate a larger investment per acre on the part of those who embark in the poultry business from year to year. This increasing cost of land can be offset by the purchase of fewer acres. As the size of yards used for the fowls to run in will determine how many fowls can be kept on one acre, the use of no yards at all would permit of keeping the maximum number on each acre and so reduce the acreage required for the establishment of a poultry farm of any given number of birds. But can poultry be kept most profitably with no yards to run in?

As previously indicated it has been found that direct sunlight is as effective as the vitamin D contained in certain foodstuffs in bringing about a normal utilization of the calcium and phosphorous ingested in the feed eaten.

The open front house will permit a certain amount of direct sunlight to reach fowls that are continuously confined but table 2 would indicate that it will not admit enough to meet the optimum requirements of the birds in autumn, winter and early spring when the sun's rays are not so abundant or so strong as in midsummer.

It would, therefore, appear to be necessary for poultry of all ages to get out-of-doors for at least a part of the year in order to obtain enough direct sunshine to meet their needs. It has been urged in the past that the exercise obtained out-of-doors was more beneficial to birds than indoor exercise, even in a well ventilated, open front house. This belief is now being seriously questioned. Close students of the problem are beginning to look upon yards or range as being of value principally because of the more complete exposure to direct sunlight obtained by the birds in this way and, in the case of range, because of beneficial additions to the diet obtained by the stock in foraging over the land.

If this be true, small yards should perhaps prove equally as satisfactory as large yards or free range in providing the benefits of sunlight. The difficulty, however, with small dirt yards is that they are very difficult to keep sanitary. It is a recognized fact, in the case of dirt yards, that as the yard space per bird decreases, the rapidity with which the soil becomes contaminated with filth and disease germs increases. Yards less than 50 feet long and too narow to turn a horse and plow in would have to be spaded as a means of cleansing the soil, if cultivated at all, and spading is costly as well as strenuous work.

For these reasons concrete yards are being installed or seriously considered by poultry keepers who cannot give their stock free range but must keep them under yarded conditions. Such yards are being advocated for both young and adult stock. How large they should be the authors do not feel competent, as yet, to say. The majority opinion at present seems to be that the yard should have the same area as the pen within the house, be laid with a good slope for rapid drainage and have a very smooth surface which can be kept cleaner than a rough surface.

Concrete yards can perhaps be used more in winter than dirt yards. The fowls can usually be allowed out in them right after a rain. On the other hand, in localities where the soil is heavy, birds using dirt yards might have to be confined and deprived of the full benefits of running out-of-doors during most of the winter and early spring. The soil would be too muddy between storms to let them run on it if the eggs were to be kept clean and the straw litter dry. In hot weather a concrete yard can be covered with litter and natural or artificial shade provided in order to make it cooler for the birds.

Gates and Fences.—As pointed out previously an overhead litter carrier would be too small to use advantageously in removing dirty litter from the floor of a long laying house. This work can best be done with a horse and wagon and if the house is of the shed roof type

with reasonably large yards in front, means must be provided to get the wagon from yard to yard so that it can be backed up to the doors in the front of the house and loaded. This is accomplished by means of removable 8-foot panels placed in each line fence. With these

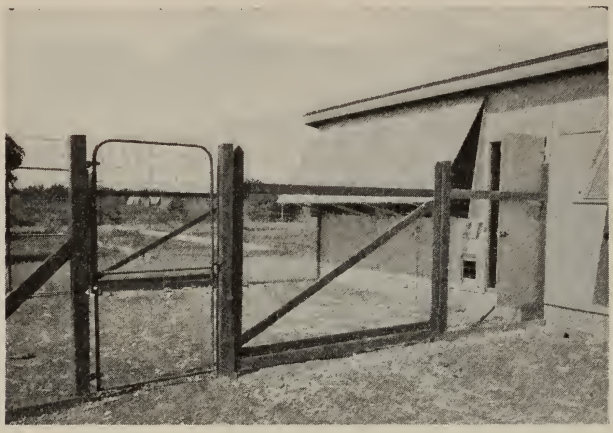


Fig. 58.—A close view of an 8-foot removable fence panel showing construction in detail.

Fig. 59.—Poultry yards with removable 8-foot panels in each line fence near house. The end and corner posts are 4 × 4 inches, the line posts are 2 × 2 inches. The braces on inside line fences are as shown in figure 60 but the outside line posts are braced more solidly to withstand the stretching of the extra heavy fencing used around the outside of these yards.

panels removed, a driveway is provided along the front of the house and, if the yards are wide enough, no difficulty will be experienced in backing the wagon up to the front door of each pen. The construction of these panels is clearly shown in figure 58.

Walk gates may be placed wherever most convenient. At the end of the yard, as shown in figure 59, will usually be found the most desirable location as it enables the poultryman to leave or enter any yard without passing through other yards. A horse and plow can be taken through the walk gate.

In the construction of fences, 4 × 4 inch rough lumber 9 feet long makes very satisfactory corner, end and gate posts and 2 × 2 inch rough lumber 8 feet long makes neat, inexpensive line posts. The

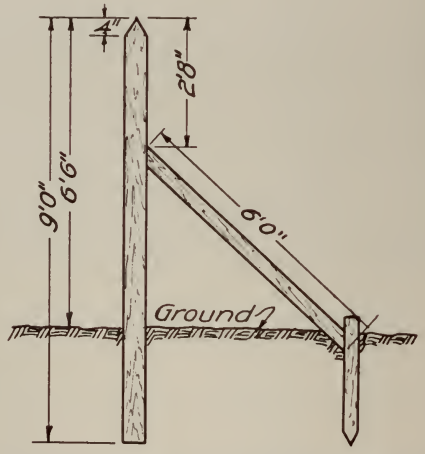


Fig. 60.—Detail of brace for corner, end and gate posts.

posts are set so that they project 6 feet 6 inches above ground for 6-foot fencing and the tops are beveled (figure 60). This places these posts sufficiently deep in the ground on heavy soil, but for sandy soil they may need to be longer and placed deeper. The braces used for corner and end posts can be made of 2 × 4 inch lumber and should be placed at an angle of 45° (figure 60). If the distance over which the wire is stretched is longer than a 45° brace will take care of, however, the brace should be made longer. The steeper the brace and the narrower the upper surface, the more difficult it will be for chickens to walk up the brace and fly over the fence.

POULTRY HOUSE APPLIANCES

Litter Carriers.—The commercial laying house described previously has been designed for a litter carrier and in the following figures are shown different styles of litter carriers that may be used. In figure 61 is illustrated a home-made carrier of simple construction that anyone reasonably skilled in carpenter work can build. It is suspended slightly off center so that the weight of the carrier holds the

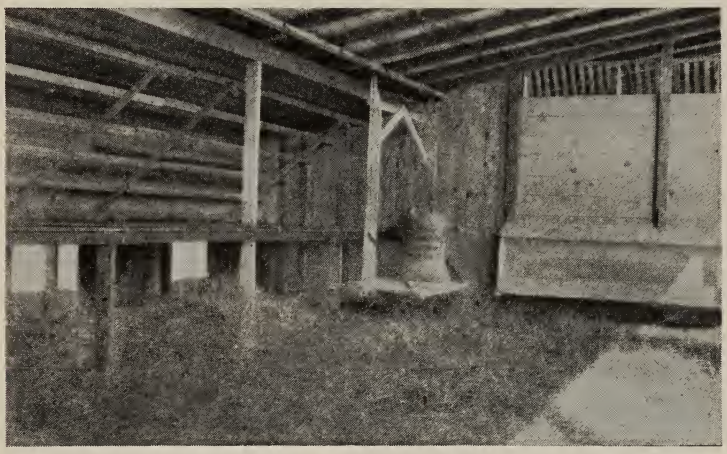


Fig. 61.—A home-made litter carrier in use in a commercial laying house in Yolo county. The construction of this carrier is shown in detail in figures 62 and 63.

rollers on the ends of the projecting 10-inch arms against the droppings board. The two removable manure boxes (figure 63), are light enough when filled with roost manure to be lifted off the carrier and dumped. They protect the carrier platform from becoming soiled with manure so that it is always in condition to carry feed and eggs. The flat platform is convenient for carrying sacks or cans of feed, or cases or buckets of eggs.

In figure 64 is shown a manufactured, all metal litter carrier which can be raised and lowered. The round bottom tub can also be unhooked and replaced with a flat platform when the carrier is to be used for distributing feed or collecting eggs.

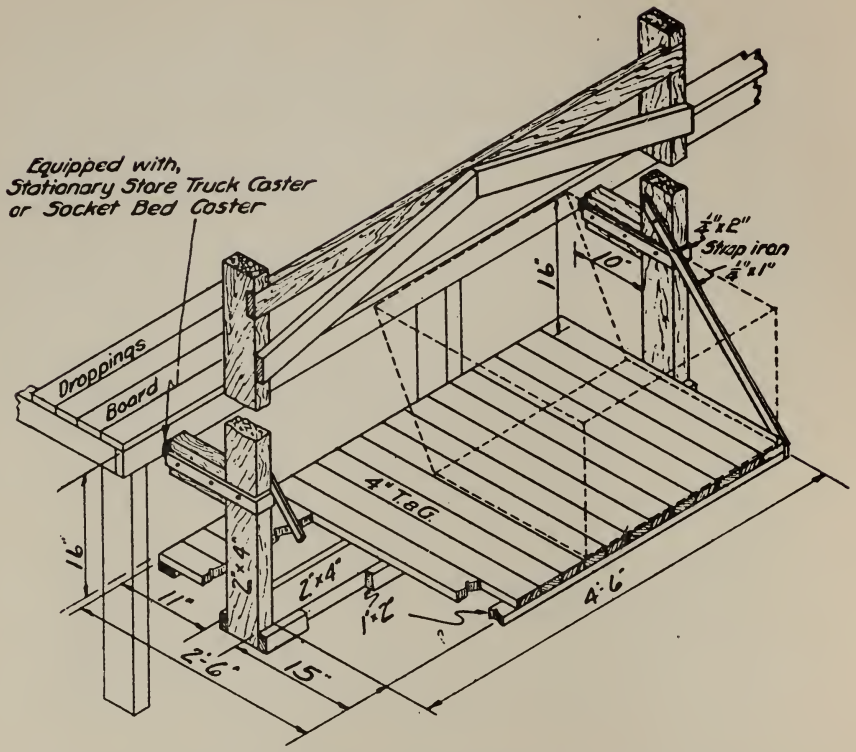


Fig. 62.—Plan for the construction of litter carrier shown in figure 61.

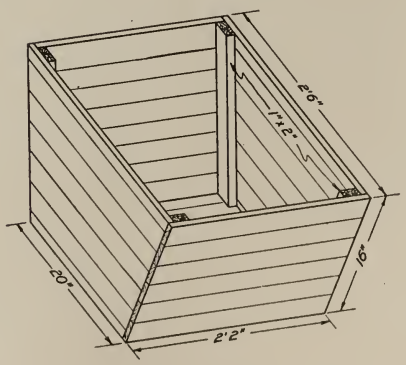


Fig. 63.—The manure box shown may be made of wood or light galvanized iron, with light band iron reinforcing the corners. Two boxes fit conveniently on the carrrier platform.

Fig. 64.—A manfactured, all metal litter carrier in use on a large poultry farm in San Luis Obispo county.

NESTS

A number of different nesting arrangements are described and illustrated and their advantages and disadvantages pointed out. In determining the number of nests required for a certain number of hens, the concensus of opinion is that one nest should be provided for every six hens.

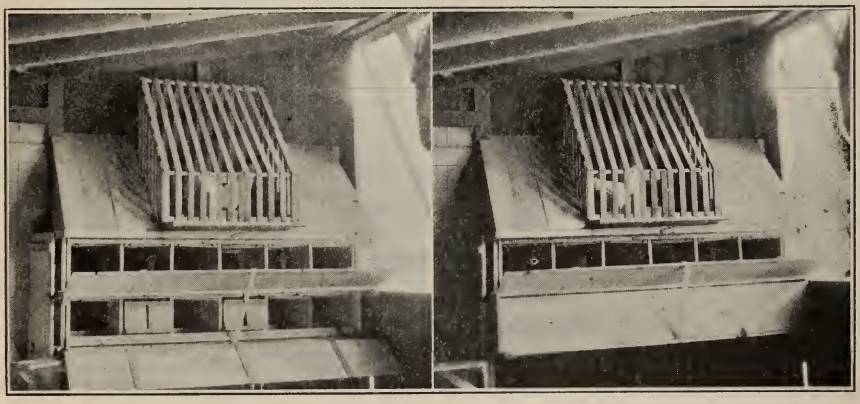


Fig. 65.—Nest and broody coop unit. A compact, convenient arrangement of nests and broody coop. (From Cir. 268.)

Nest and Broody Coop Unit.—A very compact and effective nesting arrangement is illustrated in figures 65 and 66. It consists of a light frame holding two tiers of nests and a broody coop. The broody coop is made of lath with one-inch mesh wire bottom. It rests on two supporting strips and is removable. A wood tray slides beneath the broody coop to catch the droppings which fall through the wire mesh bottom.

The nests are built in batteries of four to six nests each and the ends of each battery rest on supporting strips, which form a slideway so that the batteries can be slid out and removed. There is a walkway in front of each tier of nests and a drop door in front of the walkway. This door not only closes the entire nesting compartment, providing a secluded, slightly darkened place for the hens, but gives ready access to the nests for collecting eggs and cleaning.

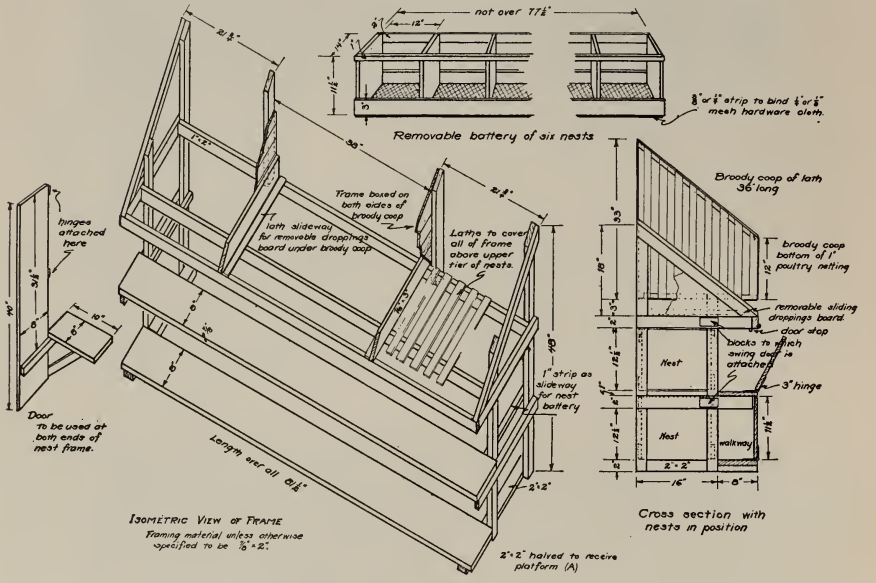


Fig. 66.—Working plans for the construction of nest and broody coop unit. (From Cir. 268.)

The hens enter the walkway and gain access to the nests from one or both ends. In figure 65 only one end is left open, owing to the limited wall space. This opening can be closed at night with a small door which folds back out of the way during the day. Attached to the inside of the door is a small platform; the hens fly from the floor to this platform and then either enter the walkway leading to the lower tier of nests or fly on up to the walkway leading to the upper tier.

These nests may be made into California No. 1 trapnests (figure 74) by attaching trapdoors and inside stops.

Nests Under Droppings Boards.—It is not desirable to locate nests under the droppings board. It not only shuts out some light from the rear part of the floor but also prevents the poultryman from observing the area under the droppings board without stooping. Considerably

less material and carpenter work, however, are required to install the nests than is the case when they are placed on the front or side walls.

The nests shown in figures 67 and 68 are built in sections or batteries of five nests each, but the number of nests per section can be varied to fit the particular poultry house being equipped. The ends of

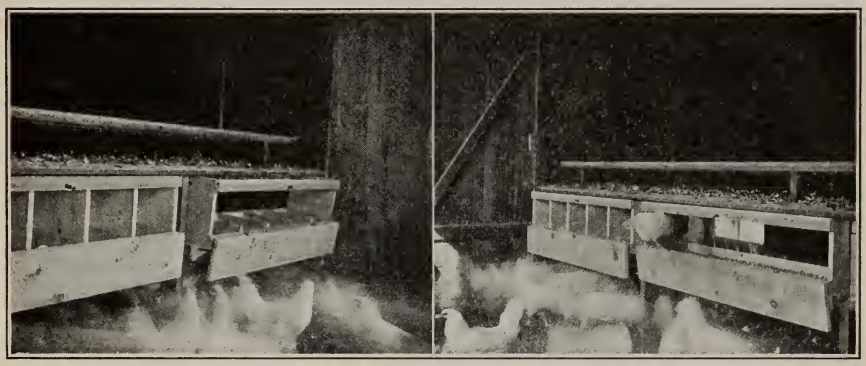


Fig. 67.—Nests under droppings board. Nest sections with high partitions, low partitions and no partitions are shown. (From Cir. 268.)

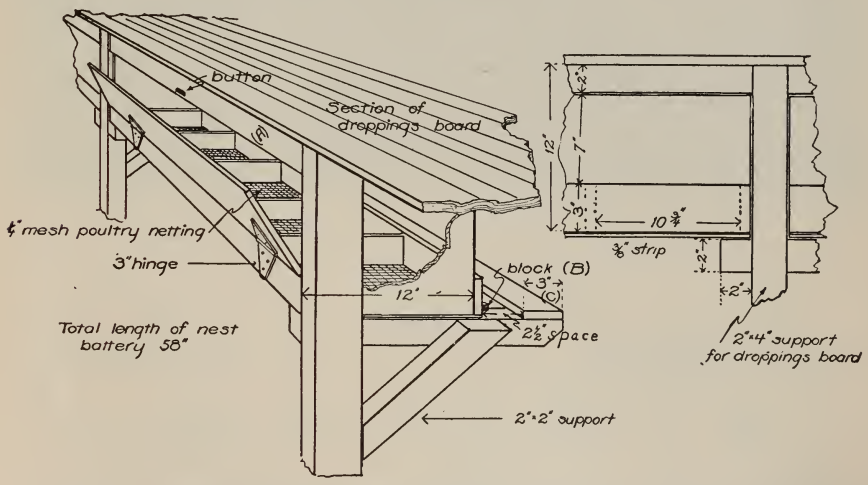


Fig. 68.—Working plans for nests shown in figure 67. (From Cir. 268.)

each section rest on strips which serve as a slideway permitting the nests to slide in and out. These strips are supported by brackets fastened to the front legs of the droppings board, as indicated in figure 68.

Nests on Front Wall.—Nests on the front wall of the poultry house are shown in figures 69 and 70. The amount of wall space below the open front in a well designed California laying house, however, is not

sufficient to permit of more than one tier of nests if they are placed at least 16 inches above floor. With only one tier enough front wall space would probably not be available to provide nests for the number of hens the pen would properly care for.

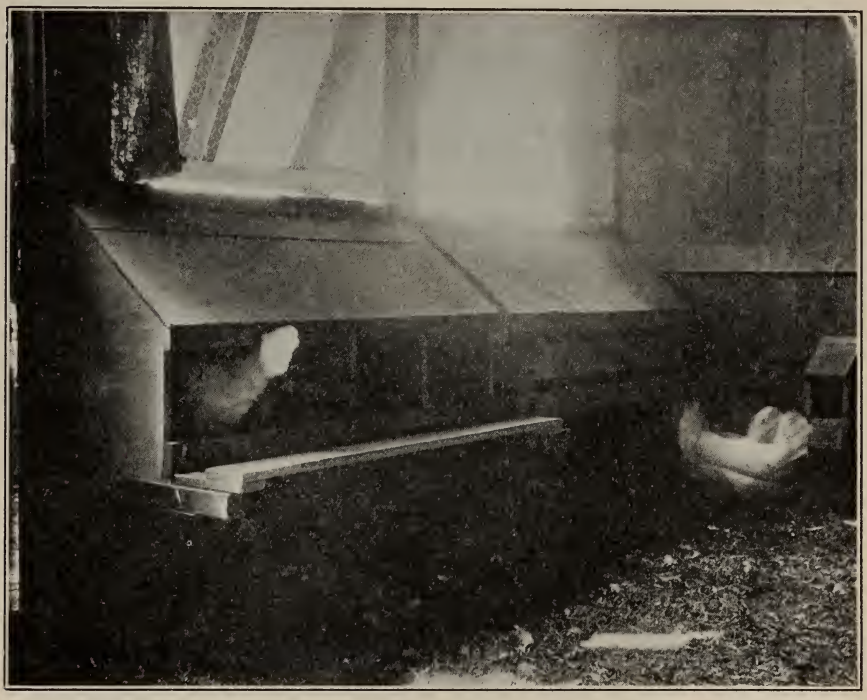


Fig. 69.—Nests on front wall of house. (From Cir. 268.)

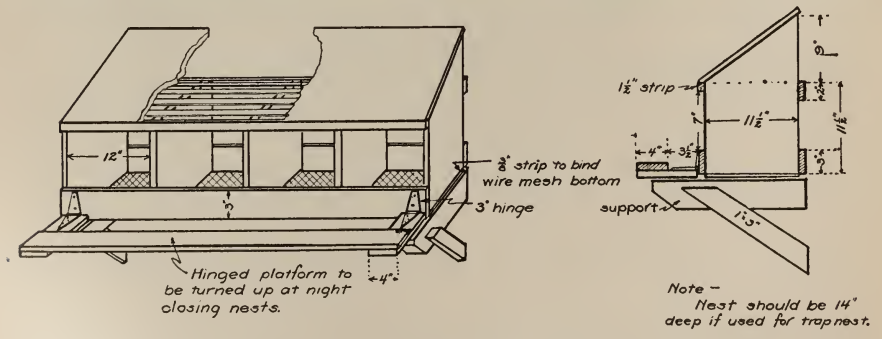


Fig. 70.—Working plans for wall nests shown in figure 69. (From Cir. 268.)

Nests on Side Wall.—In figure 71 is shown a four-tier battery of nests designed to be placed on the side wall. This is probably the most desirable place in a laying house for nests, all things considered. Figure 72 shows a three-tier battery with four kinds of nest bottoms:

Fig. 71.—Four tiers of nests on side wall with 3-section broody coop above. Broody hens are put from nests into section of broody coop at left; the second day they are driven into the center section; the third day into the section at the right; the fourth day they are released. A sliding board forms part of the partition between each section. The hinged platforms of the two upper tiers of nests are shown fastened up against the nests to keep hens from roosting in them. The platforms for the two lower tiers work in the same way.

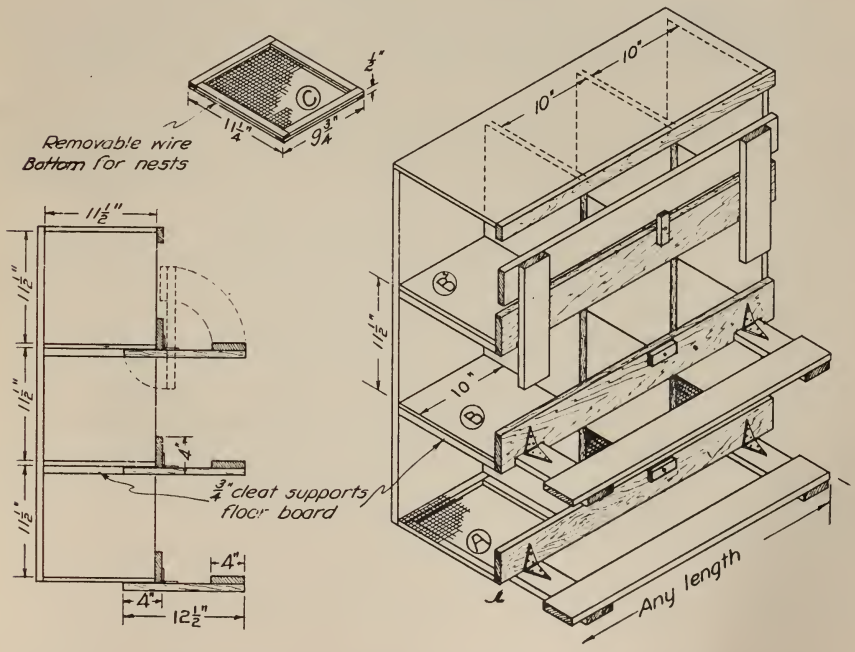


Fig. 72.—Method of constructing side wall nests shown in figure 71. At *A* is shown a ⅛-inch mesh hardware cloth bottom which may be permanent or made removable as at *C*. At *B* is shown a board bottom which may also be permanent or removable as at *B*1.

1. Permanent wood bottom (B), 2. Removable wood bottom (B^1), 3. Permanent, ⅛ mesh, galvanized hardware cloth bottom (A), 4. Removable, hardware cloth covered, wood frames, used as individual nest bottoms (C).

The platforms in front of these nests are hinged to fold up and close the nests to prevent fowls from roosting in them. These platforms can be connected with flexible picture wire or light toilet chain in the middle or at the ends so that they will all fold up when the top one is raised and buttoned against the nests. The top tier of nests may be stripped with lath and a slanting wood cover used

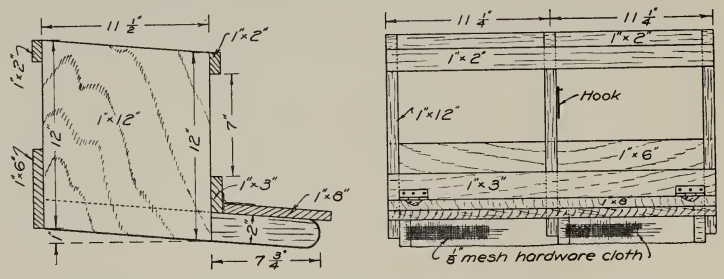


Fig. 73.—Working drawings for nest with special egg compartment. This nest may be tiered three high with the top tier covered the same as figure 69.

to keep fowls from roosting on the nests as shown in figure 69 or this cover may be a wooden frame covered with 2-inch mesh wire netting or with lath. If a broody coop is desired, it may be built above the nest battery as shown in figure 71.

Nest with Special Egg Compartment.—In figure 73 is shown a nest having a compartment separate from the nest proper into which the egg rolls as soon as it is laid. The purpose of this compartment is to keep the eggs as clean as possible and protect them from breakage. The entire bottom is sloped just enough to cause an egg to roll slowly out from under the hen and into the egg compartment just as soon as it is laid. The rolled netting covering the front of the compartment has enough of a cushioning effect to prevent any injury to the shell when the egg rolls against it and stops.

TRAPNESTS

The purpose of a trapnest is to definitely determine individual laying performance and to fix the identity of each egg with the hen that laid it. Trapnesting represents the first step in pedigree breeding. It is not intended to be used to reveal unprofitable producers in a laying flock; such birds can be more economically culled by well established methods of judging of the laying qualities of fowls on the basis of external physical indications.

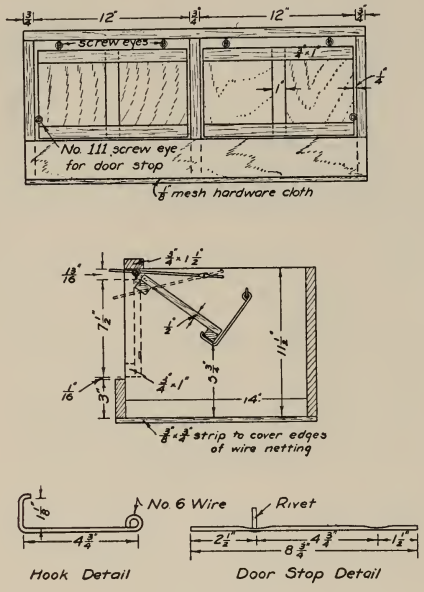


Fig. 74.—Working drawings for California trapnest No. 1.

California Trapnest No. 1.—A simple box nest costing little more to build than an ordinary nest is shown in figure 74. The door is hung with four No. 111 screw eyes. The eyes of the two that are screwed into the wood strip from which the door hangs are opened sufficiently to receive the eyes of the other two which are screwed into the top of the door itself. This permits of unhooking and removing the doors when it is desired to eliminate the trapnest feature and use as a regular nest.

To set the nest, the protruding end of the inside stop is raised and the door is swung in and held at the bottom by the wire hook. *It should be held at just the right height to cause a hen slipping under*

the door into the nest to raise it with her back enough to release the hook and allow the door to close behind her. The door does not close with a bang. It slips quietly down the fowl's back and over her tail as she goes farther into the nest.

To release the hen, the door is pushed in and she is caught in the two extended hands as she comes out. The left hand is slipped under her breast until the fingers gasp both shanks at the hock; the right hand should rest on the back with the spread fingers holding the wings to the body. The hen is then tucked under the left arm, and with the right hand the nest door is reset and the egg removed.

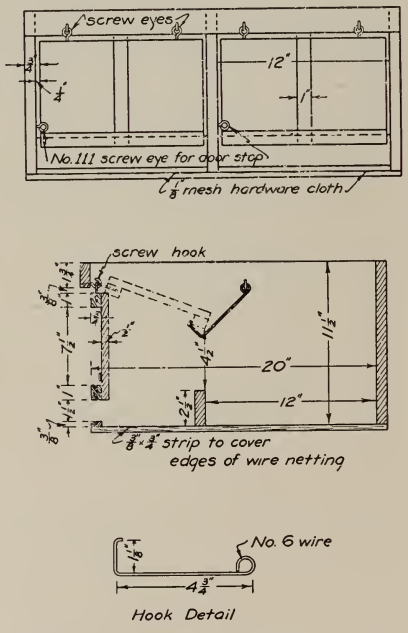


Fig. 75.—Working drawings for California trapnest No. 2.

California Trapnest No. 2.—Another nest similar to California trapnest No. 1, is shown in figure 75. The platform, however, which is placed in front of the No. 1 nest for a hen to jump upon in order to enter, has here been made a part of the trapnest itself (figure 75). This makes the nest deeper. By making the platform a part of the nest and moving the door forward to the front edge of this platform, no inside door stop is needed and the nest is more roomy. A hen cannot enter the nest while it is occupied by another because the door closes the platform as well as the nest. Both the No. 1 and the No. 2 nests are operated in the same way.

California Trapnest No. 3.—This nest uses a trapnest front brought from England; the original designer of which is not known. The trap door slides up and down and is very quickly set. The two heavy wire arms that release the door and allow it to close are so placed that a hen rarely fails to "trip" the door in entering the nest. This trapnest is illustrated in figure 76.

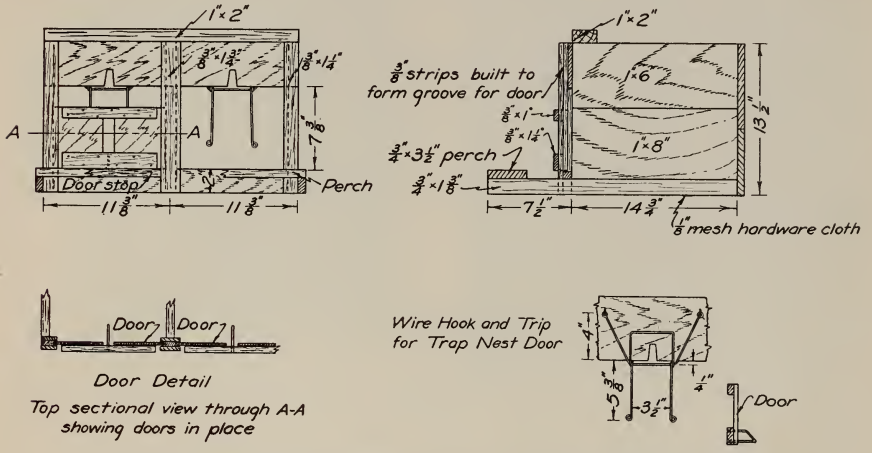


Fig. 76.—Working drawings for California trapnest No. 3.

Nest Bottoms.—A nest bottom made of ⅛-inch mesh, galvanized hardware cloth or 14-mesh, heavy galvanized window screen cloth has been found more satisfactory than wood. The window screening is not so lasting as the hardware cloth but is less costly. It would, perhaps, be more satisfactory on removable nest bottoms than on those permanently installed because the wire could be much more easily replaced when worn out. Hardware cloth should last as long as the nests themselves.

A wire cloth bottom makes the nest cooler in summer, for the wire mesh permits free circulation of air. Droppings also dry very quickly and the hens, in scratching around preparatory to laying, break up the dried droppings and litter into fine particles which sift down through the nests to the floor.

These dried droppings and old litter sift down through the nests from tier to tier in such slight amounts, however, as not to bother the layers in any way. It is true that the nesting material has to be replenished more frequently than if a wooden bottom is used. But the nests are practically self-cleaning, the nesting material is kept in better shape and the eggs remain freer from dirt and stains.

Nest Partitions.—Nest sections are shown in figure 67 with high partitions (12 inches), with low partitions (3 inches), and with no partitions at all. Careful tests were made of these three types of nests by installing them side by side in each pen. It was found that the hens liked the nests with high partitions best and those with no partitions least. This was indicated by the fact that even during the spring months of heavy laying, most of the eggs were laid in the nests with high partitions, some few in the nests with low partitions, and almost none in the nests with no partitions. In order to eliminate the part that the position of any section of nests in relation to other sections might play in determining the selection made by the hens, the positions of the different sections were changed from time to time. Hens seem to prefer the greater seclusion afforded by the high partitions.

HOPPERS

One linear inch of feeding space per hen is considered sufficient in the case of dry mash hoppers because the mash is kept before the birds all the time and each bird has ample opportunity to obtain all it wants. When damp mash is fed, however, the fowls are given only what they will consume before it dries out or spoils. Hence enough hoppers are needed to permit practically every bird to eat at the same time.

As previously pointed out hoppers that feed from both sides provide twice as much feeding space for the same length of hopper as the wall hopper feeding only from one side and should cost less per bird capacity to construct. Self-feeding hoppers are suited only to dry mash feeding. Trough hoppers are used for both dry and damp mash.

Trough Hopper.—The type of mash hopper shown in figures 77 and 78 is preferred by many poultrymen because the fowls can always get to the mash as long as there is any in the hopper. A self-feeding hopper, on the other hand, may be nearly full of mash and the fowls be unable to get it if it should clog in the throat and not feed down after that in the trough below has been eaten. The type of trough hopper illustrated in figure 77 is non-wasting if filled not more than three-fourths full because the grid which lies on top of the mash prevents the fowls from throwing it out. Each two-foot length will hold a weeks' supply of mash for 24 hens and it may be made any length desired. The grid may be made of heavy, expanded metal lath with

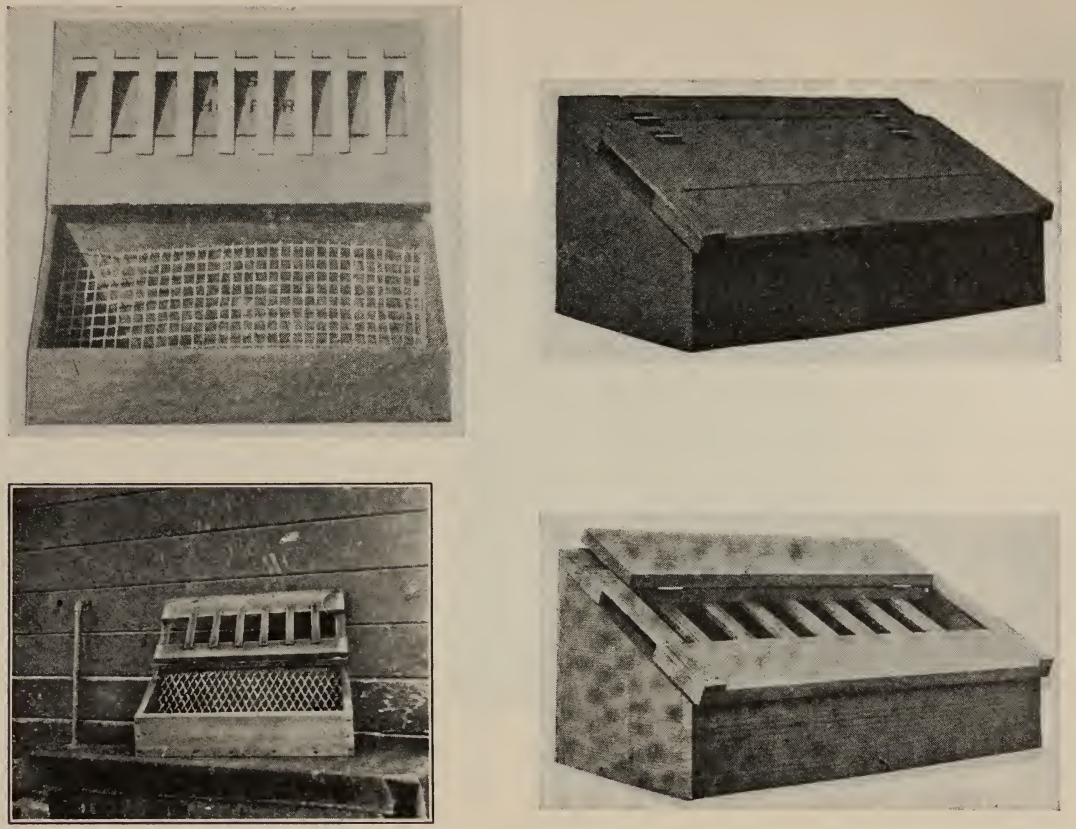


Fig. 77.—Four views of a trough-style dry mash hopper. The wire mesh grids shown in the two views with cover raised are laid on top of the mash to prevent the fowls from hooking it out and wasting it. These grids are of two kinds as explained in the text. (From Cir. 268.)

diamond-shaped openings or of ¾-inch mesh hardware cloth. The expanded metal lath weighing approximately 12 ounces per square foot and with diamond-shaped openings, or mesh, measuring ¾ inch the short way and 1½ inches the long way, inside measurements, has proven very durable and efficient. These hoppers are designed to go against the wall or to be placed back to back on a platform away from the wall.

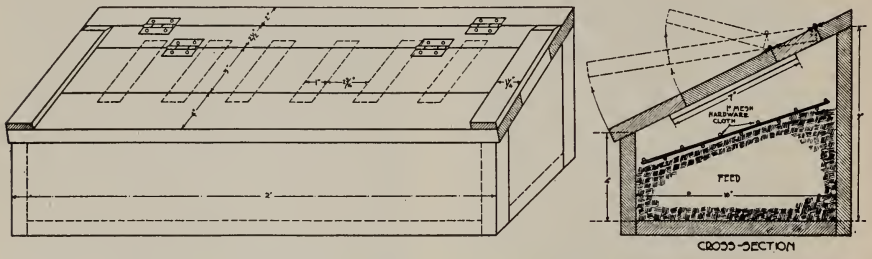


Fig. 78.—Working plan for dry mash hopper shown in figure 77. (From Cir. 268.)

Fig. 79.—Open trough hopper with reel. Light in weight and easily moved about.

Another style of trough hopper is shown in figures 79 and 80. It does not have a slatted top to keep the fowls from getting into the trough, but a reel is used for this purpose. Neither does it have a cover that can be closed when it is desired to deprive the birds of mash for certain periods daily or for certain days each week. This can only be done in an open hopper by feeding what the birds will clean up at each feeding. This hopper has the advantage, however, of combining a raised platform and trough in one simple unit that is light in weight. It does not require a grid to make it non-wasting and does not take up wall space.

The reel hopper, being easily moved, can be kept under the droppings board out of the way most of the year, if desired. Then, if artificial lighting is used in winter, it can be moved to the middle of the floor directly under the lights where it will receive a maximum of illumination. It will feed damp or dry mash equally well and can also be used for green feed. Open trough hoppers will usually be found to

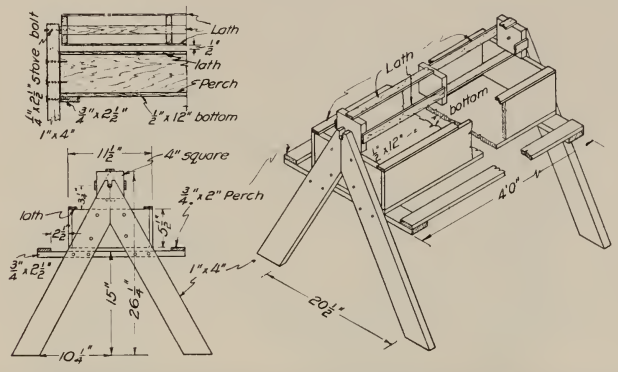


Fig. 80.—Plan for the construction of hopper shown in figure 79.

Fig. 81.—Wall type, self feeding, dry mash hopper.

give the best satisfaction when replenished with mash every day or every other day. On the basis of one inch of feeding space per hen, a reel hopper four feet long will satisfactorily serve as many hens as a single-deck wall hopper eight feet long for the hens can eat from both sides.

Wall Hopper.—Self-feeding hoppers have the advantage over most other types of hoppers of holding a large supply of feed and of not having to be filled so frequently. When used for dry mash, however,

the throat may clog up and have to be shaken or poked with a stick once or twice a day to keep each hopper feeding properly. Such hoppers are also very wasteful of feed unless the throat and trough measurements are correct because the troughs fill too full and the birds throw the feed out in picking it over.

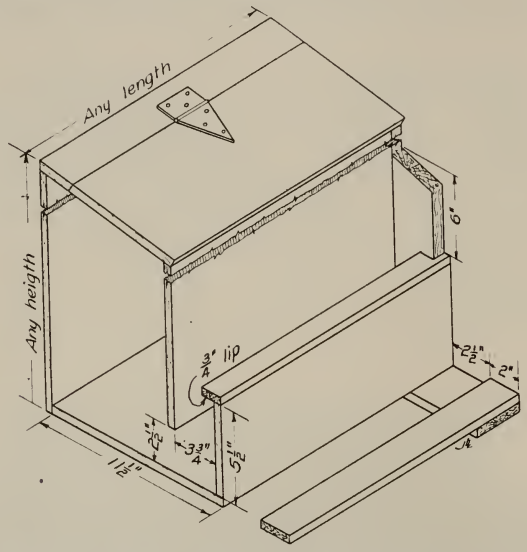


Fig. 82.—Plan for the construction of hopper shown in figure 81.

Fig. 83.—Double deck wall hopper for dry mash.

The self-feeding wall hopper illustrated in figures 81 and 82 will hold a large amount of feed and the trough has been carefully designed to prevent waste. This hopper can be built any height and length desired, but the higher it is built the more difficult it is to empty sacks of mash into it.

The double deck wall hopper shown in figures 83 and 84 provides double the feeding space of the single deck hopper without using any

more horizontal wall space. Figure 83 shows that the light breeds will use the upper deck equally as well as the lower deck.

Sliding Hopper.—The hopper shown in figures 85 and 86 is also of the self-feeding type but is designed to hang from the under side

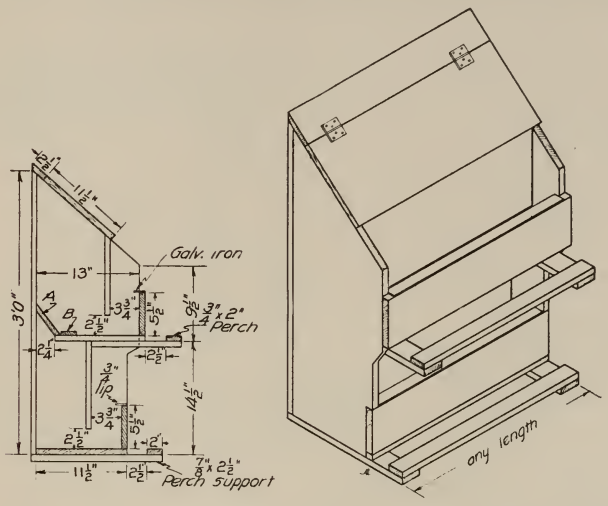


Fig. 84.—Plan for the construction of hopper shown in figure 83. *A*, removable section of upper compartment to allow for filling of lower compartment. *B*, cleat blocks to hold *A* in position.

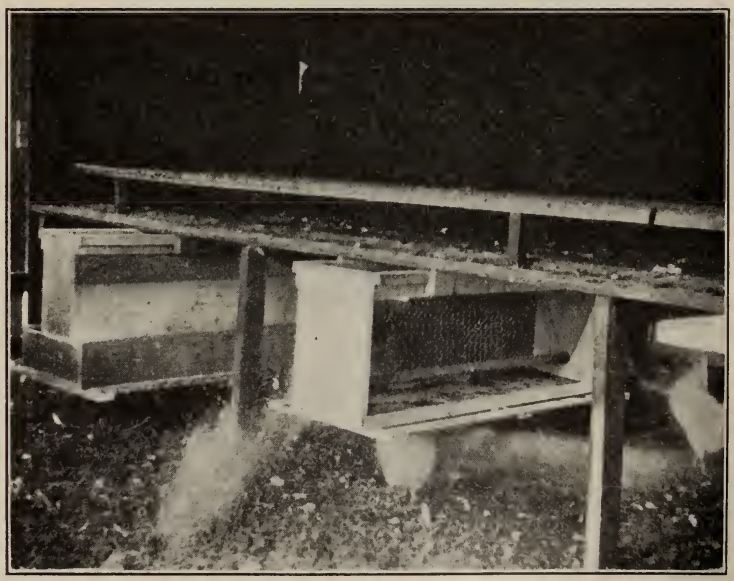


Fig. 85.—Self-feeding dry mash and green feed hoppers designed to slide under droppings board. Mash hopper at left; green feed hopper at right. (From Cir. 268.)

of the droppings board on slideways and be pulled out like a drawer. It is more compact than a single deck wall hopper, as it feeds from both sides. It also uses no wall space and unlike nests placed under the droppings board, it does not prevent the poultry keeper from readily observing the birds on the floor in the rear part of the house.

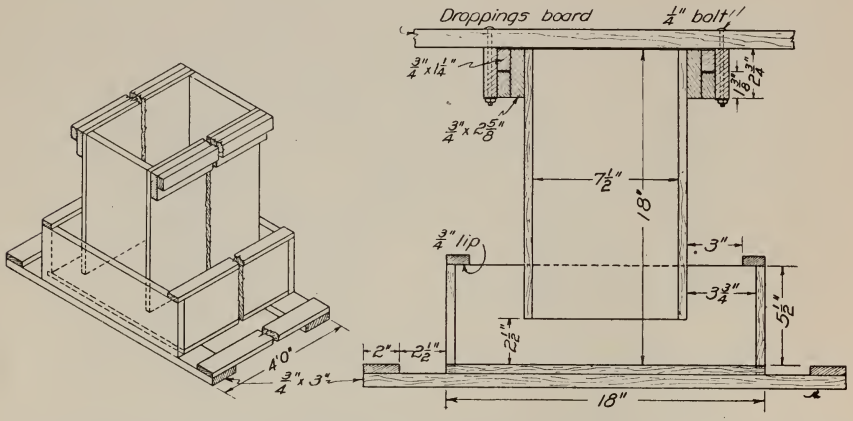


Fig. 86.—Plan for the construction of the dry mash hopper shown at extreme left in figure 85.

Fig. 87.—Wall type green feed hopper.

This hopper has the disadvantage, however, when artificial lighting is used in winter, of being located where it receives poor illumination unless a special lighting circuit is placed under the droppings board.

Green Feed Hoppers.—The most efficient way to feed finely cut green feed or chopped alfalfa hay is in a green feed hopper or rack. The use of such a hopper increases the consumption of greens and reduces waste. Fresh material remains in a clean, appetizing, succulent condition for a much longer time after being fed than it would if

thrown on the ground to be scattered by the hens and quickly dry out. One-half inch of feeding space per hen would seem to be sufficient in a green feed hopper to enable each hen to obtain enough fresh greens or chopped hay to meet her needs.

The hopper illustrated in figures 87 and 88 is made to hang on the wall. The one shown in figures 85 and 89 slides under the droppings board and feeds from both sides, so that the same length of hopper has twice the feeding space and will care for twice as many hens as

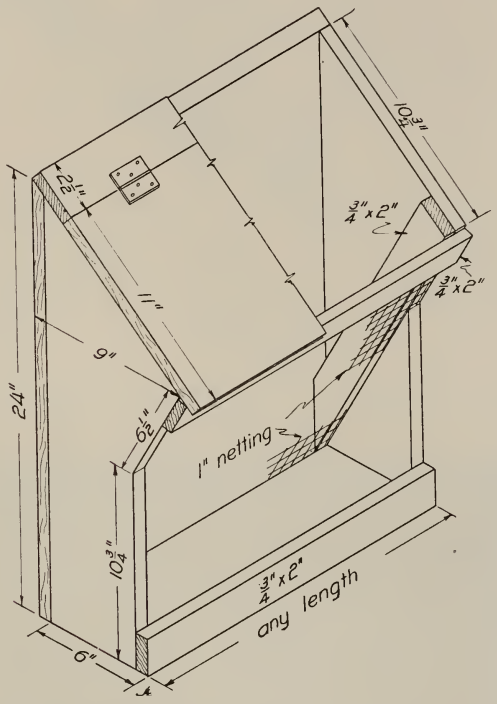


Fig. 88.—Plan for the construction of wall type green feed hopper shown in figure 87.

the wall hopper. Under the droppings board is a very convenient, out-of-the-way place for a green feed hopper when it is desirable to save wall space for nests.

In figure 90 is shown a wall type green feed hopper that is built into the outside wall of the house and tips out like a pantry flour bin. It is filled from the outside, avoiding the necessity of entering the house. It has the disadvantage, as compared with the sliding hopper shown in figure 85 of feeding from only one side so that a hopper twice as long would be needed to supply the same feeding space. For use in a house with a litter carrier in which to carry the green feed,

the sliding hopper might be more desirable. In a long house without litter carrier or alleyway such as the breeding house described in previous pages, the tip-out wall hopper might be preferable.

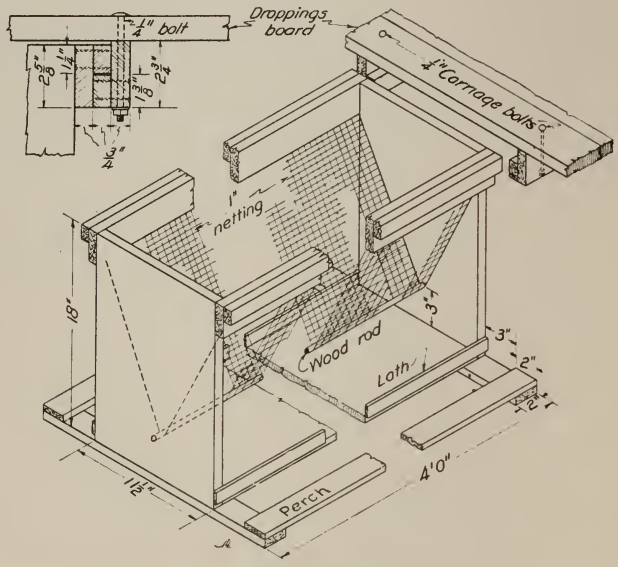


Fig. 89.—Plan for the construction of green feed hopper shown in figure 85.

Fig. 90.—Tip out style of wall hopper for green feed installed in rear wall of a long laying house.

Grit and Shell Hopper.—The hopper illustrated in figure 92 is very satisfactory for feeding shell and grit because these materials flow easily and do not clog in the throat of the hopper as do ground feeds. Two feet of feeding space per hundred birds should be ample.

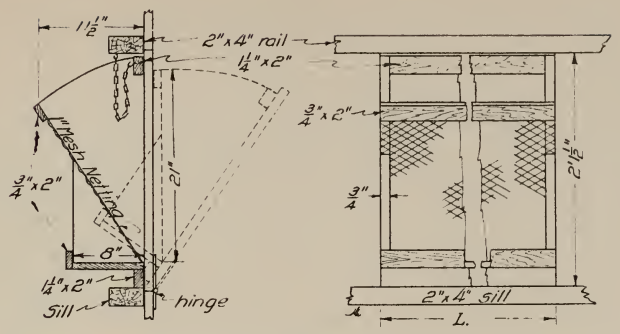


Fig. 91.—Plan for the construction of green feed hopper shown in figure 90.

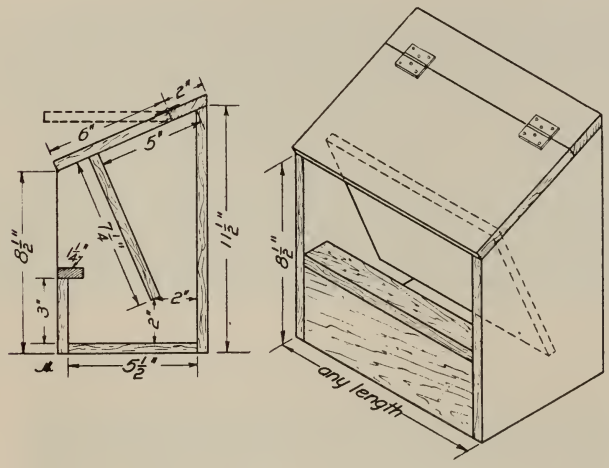


Fig. 92.—This grit, shell or whole grain hopper may be built any length desired and can be divided into compartments for grit, shell etc.

Fig. 93.—Chick mash hopper. A hopper 3 feet long, 5 inches wide and 1½ inches deep, inside dimensions, is a very convenient size.

Chick Hopper.—A chick hopper should be just shallow enough for the chicks to readily feed from, it should prevent waste and it should be easy to clean. The hopper shown in figure 93 meets these requirements satisfactorily and is simple to construct. It consists merely of a shallow tray in which the grain or dry mash mixture is placed. A grid made of ¾-inch mesh hardware cloth cut ⅛ inch smaller all around than the inside dimensions of the hopper is laid on top of the feed to prevent the chicks from scratching it out on the floor. The grid is bound with a narrow edging of galvanized iron to stiffen it and cover the raw edges.

Only as much grain or dry mash should be put into the trays each day as will be consumed that day. The trays can then be scraped out clean every day after being used. A tray four feet long will provide enough feeding space for 100 chicks, to six weeks of age. After that time deeper trays and a few more of them will be needed.

CATCHING DEVICES

Catching Hook.—In figure 94 is shown a catching hook. It is not as convenient as a catching net for most purposes but costs less to make. The hook itself should not be so tightly closed as to pinch the fowl's shank, and care should be exercised not to jerk the fowl too

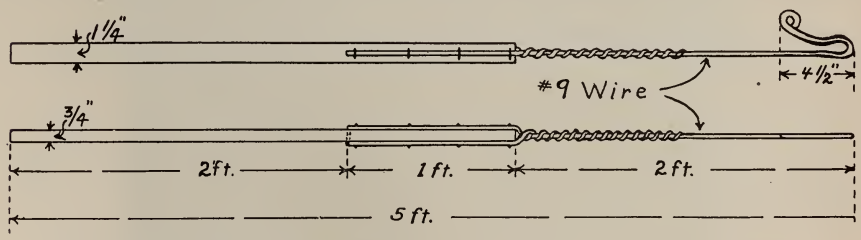


Fig. 94.—Method of constructing a catching hook. (From Cir. 268.)

hard in hooking it. When the hook is carelessly used, there is danger of bruising the fowl's shank or even breaking it. If used with care and judgment, however, a catching hook will be found reasonably convenient about the poultry yards. One could be kept on a nail in each pen, where it would be quickly available in catching sick fowls and culls as soon as discovered.

Catching Net.—A catching net (figure 95) serves the same purpose as a catching hook and most poultrymen find it more convenient to use than the hook. It is also less likely to injure the fowl. These nets can be purchased at poultry supply houses, or made at home with a

handle such as a light hoe handle, some No. 6 spring steel wire and a cord net. The net part can be woven at home or obtained at a poultry or fishing supply house.

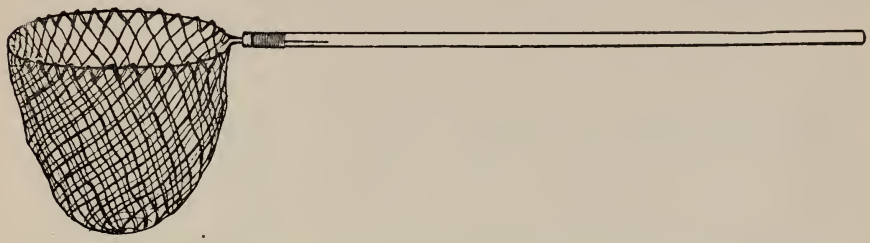


Fig. 95.—Net for catching chickens. (From Cir. 268.)

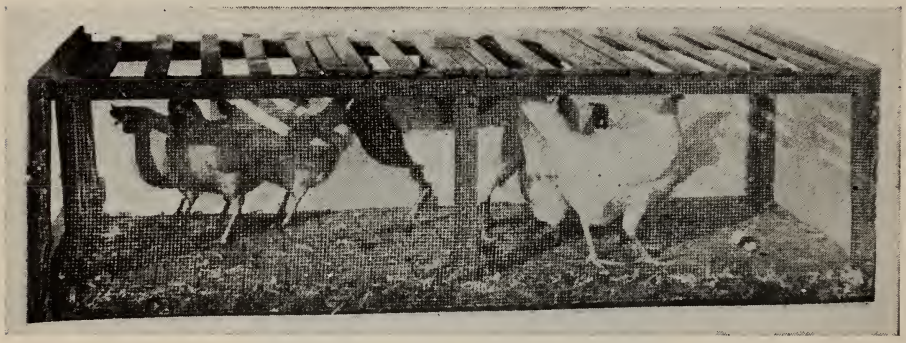


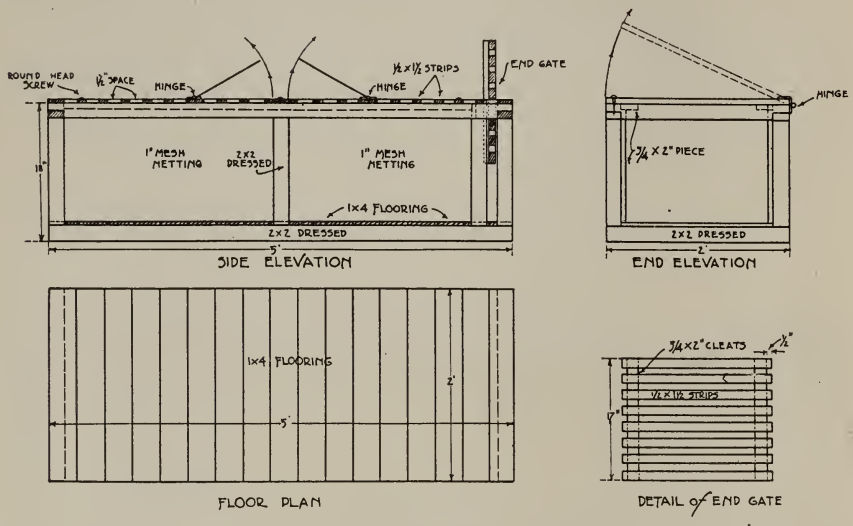
Fig. 96.—Catching coop partially filled with chickens. (From Cir. 268.)

Fig. 97.—Catching coop showing two sliding end gates and hinged trapdoors in raised position.

Catching Coop.—A catching coop (figures 96, 97, 98) and a catching panel (figure 99) are indispensable labor saving appliances when treating fowls for body lice, vaccinating for chicken pox, grading and

culling, transferring from pen to pen, or whenever considerable numbers of chickens have to be handled or moved.

In using the coop, the end with the sliding gate (figure 98) is pushed tightly against the fowl exit, a coopful of birds is run in, and



CATCHING COOP

Fig. 98.—Working plans for catching coop. (From Cir. 268.)

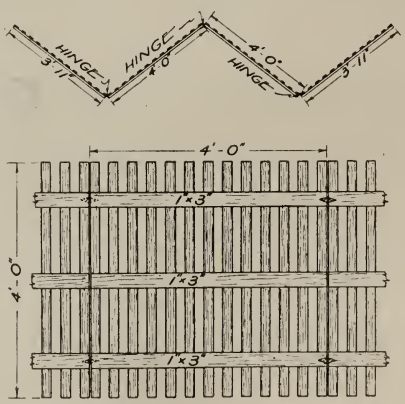


Fig. 99.—Plan for the construction of a catching panel.

the sliding gate is closed. In removing the fowls individually, the poultryman sits on the coop and withdraws one bird at a time through one or the other of the hinged doors in the top.

The catching panel is shown in figure 99. It is used by placing it in one corner of the pen or against one wall with one section held

open. A group of birds is then driven into the enclosure formed by the panel with the walls of the pen and the open section is swung to the wall to close the opening. A person can then enter this enclosure to drive the birds on into the catching coop or to catch them one at a time to administer such treatment as is desired.

WATERING DEVICES

The California poultry keeper, with few exceptions, is fortunate in being able to pipe running water to every chicken house and yard without danger of the pipes freezing and bursting in winter. It is possible to provide automatically a continuous supply of fresh water every month in the year, and a great many ingenious watering devices are being used for this purpose.

Fig. 100.—Waterer in laying house with automatic faucet and bucket attached. The construction of the galvanized iron drain pan and removable slat platform is shown in figure 101.

Waterer with Slop Pan.—In drinking from water vessels, chickens will slop a certain amount and keep the vicinity of the water vessel more or less wet, whether a trough, a pen, or a drip cup be used. This wet area around the water vessel is not only unsightly but also provides a favorable environment for the eggs or cysts of intestinal parasites. To eliminate it the watering arrangement shown in figure 100 has been designed. An especially constructed, galvanized iron pan or catch basin 18 inches square is supported in a wooden frame fastened to the front wall of the poultry house about 17 inches above the floor.

A latticed lath cover rests on top of this pan and supports a pail or shallow water vessel. An automatic faucet, or a float valve, such as are advertised in the poultry magazines and carried in stock by poultry supply houses, keeps the drinking vessel full and the water slopped around by the hens in drinking is caught in the large drain pan or catch basin which conveys it out of the house and into a sump in the ground.

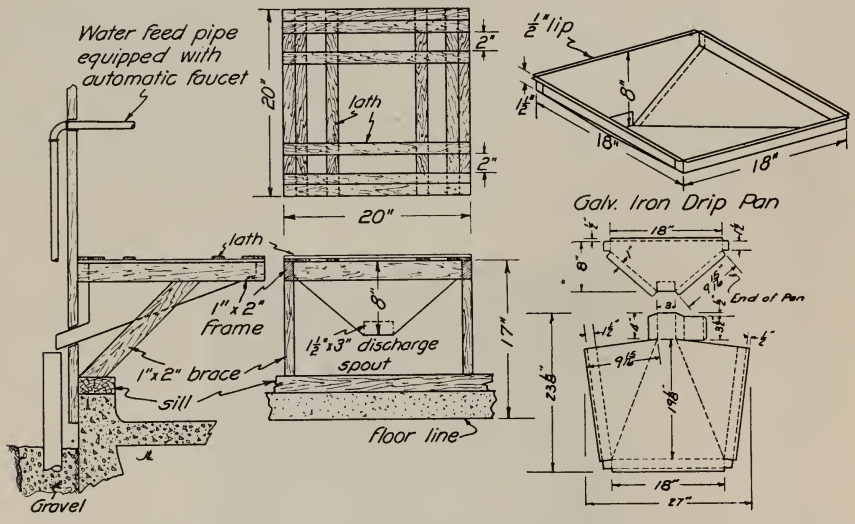


Fig. 101.—Plan showing construction of wall bracket, drip pan and removable slat platform for waterer illustrated in figure 100.

The automatic faucet is operated by the weight of the bucket (figure 100) or pan of water and can be adjusted for different sizes of vessels. When the water consumed by the birds reduces the weight of the vessel, a spring opens the faucet again. The water is thus kept at a nearly constant level. The float valve (figure 102) operates like a toilet ball-cock and will also keep the water at the desired level in the drinking vessel.

In figure 102 is shown another waterer without a catch basin beneath but with an overflow spout leading to the outside. Should the float valve get out of order and not shut off, the overflow spout would prevent the water running over on to the floor. The removable galvanized iron cone keeps the birds out of the water pan. The pan shown is of heavily galvanized iron with a galvanized iron tube soldered into one side.

If desired, a wood or metal trough may be substituted for the round pan. A galvanized iron or wood eaves trough is frequently

used for this purpose. To facilitate cleaning and prevent accidental overflowing, it should have a drain hole in the bottom emptying into a drain pipe leading out-of-doors and an overflow pipe. A coupling or bushing can be soldered or otherwise set firmly into the drain hole flush with the inside bottom of the trough. Then a piece of pipe just long enough to extend within about ½ inch of the top of the trough can be screwed into this pipe fitting. When the piece of pipe is screwed into place it serves as an overflow pipe and its removal will drain the trough.

Fig. 102.—Poultry waterer with overflow pipe soldered into side of pan and extending through wall to outside of house. Conical top has a slot cut in it that fits over the arm of the float valve.

In cool weather either of the waterers shown in figures 100 and 102 or their equivalent in other styles of waterer will take care of 150 hens in an 18 × 20 foot section of laying house but in hot weather additional drinking space will be found beneficial. Cool water and ample space to drink are very helpful in preventing losses from heat prostration. Fowls drink more frequently on hot days than on cool days. There is, therefore, a greater demand made on the water troughs. Poultry keepers may find it convenient to have auxiliary water vessels for hot weather use and thus eliminate the necessity of keeping surplus waterers clean and in repair when not needed. One-half inch of drinking space per hen should be sufficient to meet hot weather requirements in most localities.

Automatic Waterer for Chicks.—In figure 103 is shown three views of a chick waterer using an automatic float valve. This device will satisfactorily supply water to chicks from the time they are a week old until they are old enough to drink from the larger watering devices used by adult fowls. The sides of the platform are made of 1 × 6 inch boards 3 feet long. The platform is 3 feet long and 16 inches wide over all and the top is 16 inches square. It may, of course, be made longer to hold more than one water vessel if that is desired. It

is low enough so that young chicks falling off of it will not be hurt yet high enough to keep the water vessel up out of the litter.

The pan is of a common size, approximately 7¼ inches in diameter inside, and can be purchased in tin or enameled ware in almost any

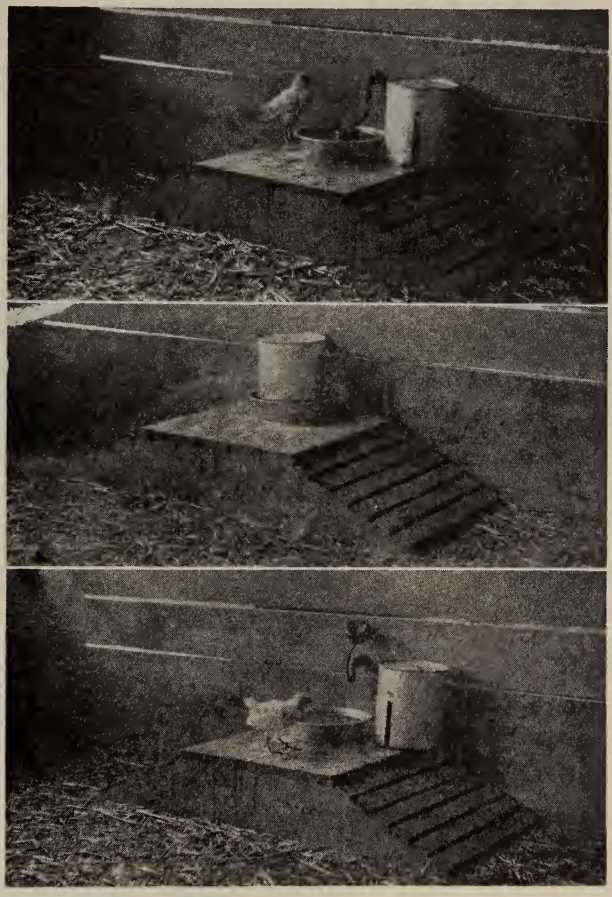


Fig. 103.—A practical, inexpensive chick waterer. In the top view the can has been removed to show the float in operating position. In the center view the can has been replaced. In the bottom view the can has been removed and the float valve turned to the "off" position for cleaning the water vessel.

hardware store. The can is the gallon size in which fruit and vegetables are packed for the restaurant trade and empty cans are usually obtainable gratis from nearby restaurants. As indicated a slot is cut in one side of the can to fit over the movable arm of the float valve. No overflow pipe as shown in figure 102 is provided but such a pipe can be put in each pan if desired. If the float valve is kept in good

working order and properly adjusted no serious trouble should be experienced with the water pan overflowing. As designed it has proven a simple, inexpensive, labor-saving device for watering growing chicks.

INCREASING THE EFFECTIVENESS OF ELECTRIC LIGHTS IN A POULTRY HOUSE[13]

It is a well established fact that a correctly designed reflector for the purpose will add greatly to the effective illumination obtained from an electric lamp. In order to determine the relative efficiency of two types of reflectors for use with electric lights in a poultry house to increase the length of the working day for the hens in winter, a night test was made in a standard 20-foot section of the 18-foot deep commercial laying house described on previous pages. These data are given here for the first time.

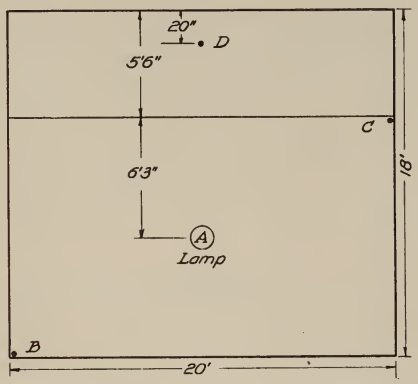


Fig. 104.—Plan showing location of R. L. M. dome reflector and points at which foot-candle readings were taken as given in table 8.

One was a standard-pattern, factory made, pressed steel reflector 12 inches in diameter. It was green enameled outside, white porclain enameled inside and known in the electrical trade as a No. 75-12 inch R. L. M. dome reflector. This reflector, containing a 100-watt, type A, lamp, frosted inside, was located in the center of the pen half way between front edge of droppings board and front wall, and at a height of 7 feet from the floor to the bottom of the reflector (figure 104). The other was a homemade tin reflector 16 inches in diameter and 4 inches deep (figure 105) originally described in Cornell Agricultural College Extension bulletin No. 90.

[13] The authors were assisted by J. P. Fairbank, lighting specialist of the Division of Agricultural Extension, in making this test.

Two of the homemade reflectors, each containing a 50-watt, mill type lamp, were located halfway between front edge of droppings board and front wall in one direction; in the other direction each reflector was equidistant from center of pen and nearest side wall (figure 105). They were suspended at a height of 6 feet from floor to bottom of reflector.

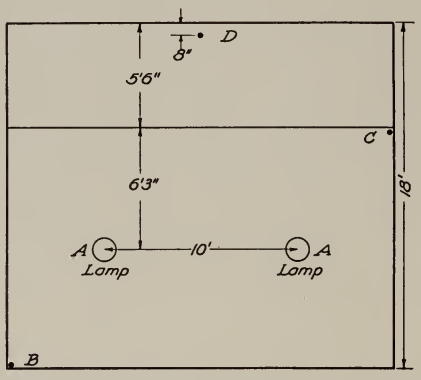


Fig. 105.—Plan showing location of home-made reflectors and points at which foot-candle readings were taken as given in table 8.

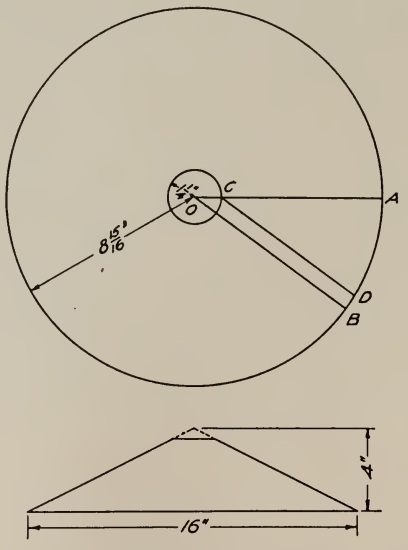


Fig. 106.—Detail for constructing the home-made reflector. Set a pair of dividers to $8\frac{15}{16}$ inches and with this as a radius scribe the large circle. With the same center, O, scribe a small circle with a radius of $1\frac{1}{4}$ inches. Draw the line *OA*. Set the dividers to $5\frac{1}{2}$ inches and lay off *AB*, and then connect *O* and *B*. To allow for the lap in putting the edges together draw the line *CD* $\frac{3}{8}$ inches from, and parallel to *OB*. With tin snips, cut out the large circle, cut along lines *AO* and *DC*, and cut out the small circle. In putting the reflector together the edge *CA* should lie along the line *OB*. Rivet and solder the reflector together and apply two coats of aluminum paint inside. Then attach the reflector to a lamp socket by means of a suitable shade holder.

The location of the lights and the points where foot-candle readings were taken are shown in figures 104 and 105. The readings obtained with the foot-candle meter are given in table 8.

The line of separation between lighted area and sharply defined shadow was 20 inches from the rear wall when the R. L. M. dome reflector was used and 8 inches from the rear wall when the two homemade reflectors were used. This was due to the fact that the homemade reflectors, as recommended in the Cornell bulletin, were hung one foot lower than the dome reflector. The R. L. M. dome reflector, on the other hand, illuminated the roosts much better.

TABLE 8

Relative Efficiency of Two Types of Reflectors for Illuminating a Poultry House

	Foot-candle readings	
	No. 75 R.L.M. reflector	Home-made reflector
On floor directly beneath reflector (A)	8.0 ft. candles	5.0 ft. candles
On floor at side wall close to front wall (B)	1.0 ft. candles	0.8 ft. candles
On floor at side wall below front edge of droppings board (C)	0.8 ft. candles	0.5 ft. candles
On floor beneath droppings board and near rear wall where area of illumination ended in a sharply defined, deep shadow (D)	0.5 ft. candles	0.35 ft. candles

As reported by the Cornell station, 0.8 foot-candle of illumination is necessary to enable birds to see well enough to find the grain scattered in the litter and to eat from the mash hoppers. In this test one R. L. M. reflector using a 100-watt lamp was sufficient to give .8 foot-candle or more over all parts of the floor in front of the droppings board. But with the two homemade reflectors, each containing a 50-watt lamp, the floor in the vicinity of C (figure 105) received less than the necessary effective amount of light and the intensity of illumination elsewhere in the pen was lower than with the dome reflector.

The R. L. M. dome reflector gave a more effective illumination of the pen than the two homemade reflectors for the same consumption of electricity and being 7 feet above the floor instead of 6, it would be more out of the way and less subject to damage. The cost of installation would probably be about the same as the price of the R. L. M. reflector would about offset the cost of the two homemade reflectors and one more lamp socket.

Painting Poultry Buildings and Fences.—The slogan, "Save the Surface and you Save All" expresses very clearly the value of paint in preserving building materials exposed to rain, sun and wind from the destructive action of weathering. In addition painting tastefully done adds attractiveness and distinction to the property.

The durability of a paint for any given purpose depends upon its composition. Its wearing qualities, however, may be materially influenced by the condition of the surface to which it is applied as well as by other conditions to which it is exposed. A paint containing low-grade pigments and oils cannot be expected to be as durable as one composed of high grade materials. On the other hand a high-grade paint may wear poorly because the surface to which it is applied is oily or smeared with pitch from resinous knots, etc., resulting in a weak bond between the paint and the surface covered. Good results also cannot be expected in general from paint used on surfaces exposed for considerable periods to moist conditions as, for example, building materials in contact with the ground. Paint does not penetrate deeply and the only way it can check decay is by preventing the entrance of fungi or moisture. Whenever the painted film cracks or peels off decay can enter.

Directions for thinning and applying ready mixed paint are usually given on the container. These directions should be carefully followed if best results are to be obtained.

Preservative Treatments for Farm Timbers.—Preservative treatment of a considerable portion of the wood materials used on the poultry farm will lengthen their life and thus appreciably lessen the frequency with which replacements have to be made. The use of preservative treatment on the farm has, in the past, been largely confined to fence posts. The same satisfactory results, however, may be obtained with other classes of material, such as the sills of outbuildings, where the cost and difficulty of replacement is so much greater than with fence posts.

The essentials of a good wood preservative are about six in number. It should destroy all fungus growths which cause wood to decay; remain liquid at ordinary temperatures; penetrate at least the outer surface of the wood; be permanent to the extent that enough remains to give continuous protection; be safe to use; be reasonable in cost.

Coal tar cresote is one of the best preservatives known for the treatment of wood. For brush application or open tank treatment a high-boiling, refined grade of creosote should be used. In making this product there has been removed the more volatile parts which evaporate at a low temperature and the naphthalene crystals which cause

the crude creosote to solidify at about 50 degrees F. The commercial creosote used for the pressure treatment of railroad ties and large timbers is not suited to the brush, open tank and dipping treatments.

The open tank process consists of heating the wood in the preservative for one or more hours at a temperature of approximately 200 degrees F. It is then transferred to a tank of cold oil having a temperature of not less than 50 degrees F and left for an hour or more. The hot oil bath opens the pores of the wood and the sudden cooling when transferred to the cool oil brings about an increased penetration of oil into the wood. Instead of using a cool bath, similar results can be obtained by leaving the wood in the hot bath and letting it cool, but it takes longer.

With the open tank treatment, it is desirable to have the sapwood entirely penetrated with the oil. This, however, cannot always be accomplished. A penetration of ½ to ¾ of an inch will give very good results and even lighter penetrations will give sufficient protection to amply pay for the cost of treating. The length of time the wood is in the hot bath determines the penetration and the length of time in the cold bath governs the absorption of oil. If the penetration is insufficient the period of treatment in the hot bath should be increased. If too much oil is absorbed the time in the cool bath should be shortened.

The dipping process consists in heating the wood in refined creosote for 15 minutes or longer. This causes all checks and defects to become filled with oil but the penetration and absorption may be slight as compared with the open tank method.

The brush treatment consists in applying two liberal coats of hot (at least 150° F) refined creosote to the wood. The oil should be flooded over the wood rather than painted on and the run-off caught in a pan. The first coat should be thoroughly dry before the second coat is given. Only thoroughly seasoned timber should be treated by the brush method or a sufficient penetration and absorption of the preservative to make the treatment worth while will not be obtained.

For more detailed information on the preservative treatment of fence posts and other building materials on the farm, the reader is referred to Farmers' Bulletin 744, U. S. Department of Agriculture, Washington, D. C.

DESCRIPTIVE LIST OF MATERIALS

In the following pages are given detailed lists of materials for the construction of the laying and brooder houses previously described. No material lists are given for the breeding house and feed room as these would probably be changed sufficiently in dimensions, to meet the needs of individual poultrymen, as to require a special material list in each case. Also, no attempt has been made to specify kinds and grades of lumber except in the case of siding for the outside walls. The desirability of tongue-and-groove lumber for the exterior walls of a poultry house is discussed elsewhere.

DESCRIPTIVE LIST OF MATERIALS FOR TWO UNITS OF THE 18 × 20 FOOT COMMERCIAL LAYING HOUSE

It is assumed that a person desiring to build a poultry house less than 40 feet long would prefer the farm poultry house. Material lists for houses containing more than two 18 × 20 foot units can be obtained by substituting partition wall material for that of end walls where necessary, and multiplying the list given by ½ the number of units to be built.

Concrete

Foundation

3 cu. yds. rock	
1½ cu. yds. sand	1:2½:5 mixture
14 bags cement	

Floor

4 cu. yds. rock	1:2½:5 mixture for floor base 2″
3 cu. yds. sand	thick 1:2 top, ¼ to ⅜″thick
30 bags cement	

Well graded, clean gravel may be substituted for rock and sand, using 1:5 mixture.

Forms

Use 1″ x 6″ roof sheathing for forms.

If scrap material is not on hand for stakes and ties, 360 lin. ft. of 1″ x 3″ lumber will be needed for this purpose.

Frame

Sills

4 pcs. 2″ x 4″—20′	2 pcs. 2″ x 4″—18′

Rear wall

Studding	9 pcs. 2″ x 4″— 6′	Plates	2 pcs. 2″ x 4″—20′
Rails	4 pcs. 2″ x 4″—10′	Braces	2 pcs. 2″ x 4″—16′

End walls

Studding and door heads	4 pcs. 2″ x 4″—10′
Rails	2 pcs. 2″ x 4″—18′
Braces	2 pcs. 2″ x 4″—16′

Front walls

Studding	15 pcs. 2″ x 4″— 9′
Rails and door head	4 pcs. 2″ x 4″—10′
Plates	2 pcs. 2″ x 4″—20′

Supports

Girder	2 pcs. 2″ x 6″—20′
Uprights for girder and droppings board	2 pcs. 2″ x 4″—12′

Joists for droppings board

18 pcs. 2″ x 3″— 6′ 2 pcs. 1″ x 3″—20′

Rafters

21 pcs. 2″ x 4″—20′

Roof sheathing

1100 bd. ft. 1″ x 6″

Plenty of roof sheathing is listed so that the best may be selected for facia boards and door cleats, allowance being made also for some waste of roof sheathing if used first for form lumber.

Partition

Sill	1 pc. 2″ x 4″—18′
Studding	2 pcs. 2″ x 4″—10′
	1 pc. 2″ x 4″—18′
Sheathing at end of droppings board	6 pcs. 1″ x 4″—8′
	14 pcs. 1″ x 4″—7′
Sheathing below wire	26 pcs. 1″ x 4″—9′
Door	4 pcs. ½″ x 12″—7′

Roosts

24 pcs. 2″ x 2″—10′
12 pcs. 2″ x 3″— 6′
1 pc. 2″ x 4″— 6′

Wall Sheathing

This sheathing to be 1″ x 4″ T & G laid vertically face side in.

Rear wall

150 pcs. 1″ x 4″—6′

Front wall

44 pcs. 1″ x 4″—10′
28 pcs. 1″ x 4″—14″, to cut 3′—6″

(This includes front door. See roof sheathing for door cleats.)

End walls

34 pcs. 1" x 4"—10′
36 pcs. 1" x 4"— 9′
36 pcs. 1" x 4"— 8′
32 pcs. 1" x 4"— 7′

(This includes end doors. See roof sheathing for door cleats.)

Miscellaneous

Droppings board

300 bd. ft. 1" x 4"—T & G

Hood over droppings board

275 bd. ft. 1" x 4"—T & G

Hood to rear of droppings board

150 bd. ft. 1" x 4"—T & G

Fowl doors and guides

1 pc. 1" x 12"—12′

Rear sash

6—1⅜" x 2′6"—1′6", 2—light stock sash, glazed.

Rear sash trim

3 pcs. 1⅜" net x 2½"net 18′
To cut 12 pcs.—1′6"
12 pcs.—3′0"

Curtain frames

20 pcs. 1" x 3"—12′
12 pcs. 1" x 3"—14′
2 pcs. 2" x 2"—12′ (to cut 3′0")
34 pcs. 5/16" x ¾"—6′ for cloth molding

CONDENSED BILL OF MATERIALS FOR COMMERIAL LAYING HOUSE

7 cu. yds. crushed rock
4½ cu. yds. sand
44 bags of cement
360 lin. ft. 1" x 3"
4 pcs. 2" x 4"—20′
3 pcs. 2" x 4"—18′
24 pcs. 2" x 3"— 6′
2 pcs. 2" x 6"—20′
150 pcs. 1" x 4"— 6′
46 pcs. 1" x 4"— 7′
42 pcs. 1" x 4"— 8′
62 pcs. 1" x 4"— 9′
78 pcs. 1" x 4"—10′
(T & G)
28 pcs. 1" x 4"—14′ T & G to cut 3′6" long
725 bd. ft. 1" x 4" T & G
1100 bd. ft. 1" x 6"
24 pcs. 2" x 2"—10′
10 pcs. 2" x 4"— 6′
11 pcs. 2" x 4"— 9′
14 pcs. 2" x 4"—10′
2 pcs. 2" x 4"—12′
4 pcs. 2" x 4"—16′
3 pcs. 2" x 4"—18′
25 pcs. 2" x 4"—20′
4 pcs. ½" x 12"—7′ resawn S1S
2 pcs. 1" x 3"—20′
12 pcs. 1" x 3"—14′
20 pcs. 1" x 3"—12′
3 pcs. 1⅜" x 2½" net—18′
To cut—12 pcs. 18" long
12 pcs. 36" long
1 pc. 1" x 12"—12′
6—1⅜" x 2′—6" x 1′—6"
2—light stock sash, glazed
34 pcs. 5/16" x ¾" x 6′ (saw sized)

DESCRIPTIVE HARDWARE LIST FOR COMMERCIAL LAYING HOUSE

End doors

3 pairs 5″ light strap hinges
2 Whitcomb No. 2 J barn door latches
2 screen door closers

Partition

3—4″ light T-hinges
6 ft. 36″ width 2″ mesh poultry netting
2—5/16″ x 16″ Perfection door springs
2—3/8″ x 8″ carrigae bolts for sill

Roosts

6 pairs 3″ light T-hinges
12—¼″ x 3½″ machine bolts
12—¼″ x 7½″ machine bolts
4—2½″ hooks and eyes

Rear sash

6 pairs 2″ light T-hinges
6—2″ Jap. buttons
6—2½″ hooks and eyes
16 ft. 18-in. width, 1-in. mesh poultry netting

Front doors

3 pairs 5″ light strap hinges
2 Whitcomb No. 2 J barn door latches

Curtain frame and supports

6 pairs 4″ light T-hinges
4 pairs 3″ light strap hinges
8 pairs 3″ light T-hinges
4—2½″ hooks and eyes for curtains
8—1½″ hooks and eyes for curtain supports
1—⅓ doz. 2″ Jap. buttons

Wire front

30 lin. ft. 72″ width 2″ mesh poultry netting

Foundation bolts

22—3/8″ x 8″ carriage bolts
Place 3 bolts in each end wall
4 bolts in both front and rear walls of each 20-ft. section

Roof

9 rolls 3-ply 3-ft. roofing paper

Nails

12 lbs. 20d common wire nails
45 lbs. 8d common wire nails
5 lbs. 6d common wire nails
2 lbs. ¾ common poultry staples
21 yds. 24″ heavy unbleached muslin for curtain

CONDENSED HARDWARE LIST FOR COMMERCIAL LAYING HOUSE

6 pairs 5″ light strap hinges
9 pairs 4″ light T-hinges
4 pairs 3″ light strap hinges
20 pairs 3″ light T-hinges
4 Whitcomb No. 2 J barn door latches
14 2½″ hooks and eyes
8—1½″ hooks and eyes
22 2″ Jap. buttons
36 lin. ft. 72-in. width, 2″ mesh poultry netting
16 lin. ft. 18-in. width, 1″ mesh poultry netting
12—¼″ x 3½″ machine bolts
12—¼″ x 7½″ machine bolts
24—⅜″ x 8″ carriage bolts
2—5/16″ x 16″ Perfection door springs
2—screen door closers
9 rolls 3-ply 3-ft. roofing paper
12 lbs. 20d common wire nails
45 lbs. 8d common wire nails
5 lbs. 6d common wire nails
2 lbs. ¾″ common poultry staples
21 yds. 24″ heavy unbleached muslin

Paint

3 gals. ready mixed outside paint (color as desired)

DESCRIPTIVE LIST OF MATERIALS FOR THE 16 × 20 FOOT FARM POULTRY HOUSE

Concrete

Foundation

2 cu. yds. rock
1½ cu. yds. sand — 1:2½:5 mixture
10 bags cement

Floor

2 cu. yds. rock
1¼ cu. yds. sand — Base 1:2½:5 mixture 2″ thick
14 bags cement — Top 1:2 mixture ¼″ to ⅜″ thick

Forms

Use roof sheathing for form lumber.

Frame

Sill

2 pcs. 2″ x 4″—16′
2 pcs. 2″ x 4″—20′

Rear wall

Studding 1 pc. 2″ x 4″—14′
1 pc. 2″ x 4″—10′
Rails 2 pcs. 2″ x 4″—10′
Plate 1 pc. 2″ x 4″—20′

End walls

Studding 4 pcs. 2″ x 4″—8′
Studding 1 pc. 2″ x 4″—12′
Rails 2 pcs. 2″ x 4″—16′
Brace 1 pc. 2″ x 4″—12′

Front walls

Studding 6 pcs. 2″ x 4″— 8′ Plate 1 pc. 2″ x 4″—20′
Rails 2 pcs. 2″ x 4″—10′

Supports

Girder 1 pc. 2″ x 6″—20′
Uprights for girder and droppings board 1 pc. 2″ x 4″—12′

Joists for droppings board

9 pcs. 2″ x 3″— 6′ 1 pc. 1″ x 3″—20′

Rafters

11 pcs. 2″ x 4″—18′

Roof sheathing

500 bd. ft. 1″ x 6″

Plenty of roof sheathing is listed so that the best may be selected for facia boards and door cleats, allowance is made also for some waste if roof sheathing is first used for forms.

Roosts

10 pcs. 2″ x 2″—10′

Wall Sheathing

This sheathing to be 1″ x 4″ T & G laid vertically face side in.

Rear wall

75 pcs. 1″ x 4″—5′

Front wall

22 pcs. 1″ x 4″— 9′
14 pcs. 1″ x 4″—14′, to cut 3′6″

End walls

24—1″ x 4″—6′ 36—1″ x 4″—8′
30—1″ x 4″—7′ 36—1″ x 4″—9′

This includes end doors; see roof sheathing for door cleats.

Miscellaneous

Droppings board

140 bd. ft. 1″ x 4″ T & G

Hood over droppings board

125 bd. ft. 1″ x 4″ T & G

Hood at rear of droppings board

50 bd. ft. 1″ x 4″ T & G

Fowl doors and guides

1 pc. 1″ x 12″—6′

Rear Sash

3—1⅜″ x 2′6″ x 1′6″, 2—light stock sash, glazed

Rear sash trim

1 pc. 1⅜″ x 2½″ net 12′
1 pc. 1⅜″ x 2½″ net 16′

To cut 6 pc. 1′—6″
6 pcs. 3′—0″

Curtain frame

10 pcs. 1″ x 3″—10′
6 pcs. 1″ x 3″—14′
1 pc. 2″ x 2″—12′

12 pcs. 5/16″ x ¾″ x 5′
4 pcs. 5/16″ x ¾″ x 6′
for cloth molding

DESCRIPTIVE HARDWARE LIST FOR FARM POULTRY HOUSE

Doors

3 pairs 5″ light strap hinges
2 Whitcomb No. 2 J barn door latches

Curtain frame and supports

3 pairs 4″ light T-hinges
2 pairs 3″ light strap hinges
4 pairs 3″ light T-hinges
2 2½″ hooks and eyes for curtains
4 1½″ hooks and eyes for curtain supports
8 2″ Jap. buttons

Rear Sash

3 pairs 3″ light T-hinges
3 2½″ hooks and eyes
3 2″ Jap. buttons
8 ft. 18-inch width 1-inch mesh poultry netting

Wire front

16 lin. ft. 60-inch width, 2-inch mesh poultry netting

Roosts

3 pairs 3″ light strap hinges
2 2½″ hooks and eyes

Miscellaneous hardware

14—⅜″ x 8 carriage bolts
3 placed in end foundation walls
4 placed in front and rear walls
4½ rolls—3-ply roofing paper
6 lbs.—20d common wire nails
25 lbs.—8d common wire nails
2½ lbs.—6d common wire nails
1 lb.—¾″ staples
10 yds.—24″ heavy unbleached muslin for curtains

Paint

1½ gals. ready-mixed outside paint (color as desired).

DESCRIPTIVE LIST OF MATERIALS FOR A 40-FOOT UNIT OF BROODER HOUSE

Concrete

Foundation

3½ cu. yds. rock	
1¾ cu. yds. sand	1:2½:5 mixture
16 bags cement	

Floor

4 cu. yds. rock	1:2½:5 mixture
3 cu. yds. sand	Floor base 2″ thick
30 bags cement	1:2 top, ¼″ to ⅜″ thick

Forms

Use 1″ x 6″ roof sheathing for forms

Frame

Sills

2 pcs. 2″ x 4″—16′	2 pcs. 2″ x 4″—20′
3 pcs. 2″ x 4″—18′	

Rear wall

Studding	8 pcs. 2″ x 4″— 6′	Plates	2 pcs. 2″ x 4″—16′
	1 pc. 2″ x 4″—16′		2 pcs. 2″ x 4″—10′
Rails	2 pcs. 2″ x 4″—16′	Braces	2 pcs. 2″ x 4″—16′
	1 pc. 2″ x 4″—18′		

End walls

Studding and door heads	2 pcs. 2″ x 4″—16′
Rails	2 pcs. 2″ x 4″—14′
Braces	2 pcs. 2″ x 4″— 8′

Front wall

Studding	13 pcs. 2″ x 4″— 9′
Rails and door heads	4 pcs. 2″ x 4″—10′
Plates	2 pcs. 2″ x 4″—20′

Rafters

16 pcs. 2″ x 4″—20′
4 pcs. 2″ x 4″—24′
2 pcs. 2″ x 4″— 6′

Roof sheathing

1175 bd. ft. 1″ x 6″

Plenty of roof sheathing is listed so that the best may be selected for facia boards and door cleats; allowance also is made for some waste of roof sheathing if used first for form lumber.

Wall Sheathing

This sheathing to be 1″ x 4″ T & G laid vertically face side in.

Rear wall

150 pcs. 1″ x 4″—6′

Front wall

60 pcs. 1″ x 4″—10′ 24 pcs. 1″ x 4″—14′, to cut 3′6″

This includes doors. See roof sheathing for door cleats.

End walls

34 pcs. 1″ x 4″—10′ 32 pcs. 1″ x 4″— 7′
36 pcs. 1″ x 4″— 9′ 36 pcs. 1″ x 4″— 6′
36 pcs. 1″ x 4″— 8′ Storage space

Miscellaneous

Chick doors and slides

1 pc. 1″ x 12″—14′

Rear sash and trim

2 1⅜″ x 2′—6″ x 4′ 8—light sash glazed
2 pcs. 2″ x 8″ x 4′ stock sill
2 pcs. 1″ x 6″ x 12′ stock casing

Curtain frames

24 pcs. 1″ x 3″—12′ 4 pcs. 2″ x 2″— 6′ (to cut 3′0″)
4 pcs. 1″ x 12″— 6′ 30 pcs. 5/16″ x ¾″— 6′ for cloth
8 pcs. 1″ x 3″— 8′ molding

Partitions for pens

Sill 2 pcs. 2″ x 4″—20′ Base 3 pcs. 1″ x 12″—14′
Plates 2 pcs. 2″ x 4″—20′ 4 pcs. 1″ x 12″—10′
Studding 11 pcs. 2″ x 4″— 7′ Inside pen doors
3 pcs. 2″ x 4″— 8′ 16 pcs. 1″ x 3″—6′
4 pcs. 1″ x 3″—7′

DESCRIPTIVE HARDWARE LIST FOR BROODER HOUSE

Outside doors

9 pairs 5″ light strap hinges 6 Whitcomb No. 2 J barn door latches

Pen doors

4 pairs 4″ light T-hinges 4 3″ hooks and eyes

Curtain frames

6 pairs 4″ light T-hinges 4 2½″ hooks and eyes
12 pairs 3″ light strap hinges 8 1½″ hooks and eyes
1 ⅓ doz. 2″ Jap. buttons

Rear Sash

2 pairs metal window shields 2 cupboard catches

Wire front

28 lin. ft., 72-inch width, 1-inch mesh poultry netting.

Pen partitions

100 lin. ft., 72" width, 1" mesh poultry netting.

Miscellaneous hardware

14 ⅜" x 8" carriage bolts for sills
10 rolls 3-ply 3 ft. roofing paper
12 lbs. 20d common wire nails
50 lbs. 8d common wire nails
6 lbs. 6d common wire nails
3 lbs. ¾" galv. staples
16 yds. 27" heavy unbleached muslin.

Paint

3 gals. ready mixed outside paint (color as described).

DESCRIPTIVE LIST OF MATERIALS FOR THE 8 × 8 FOOT KNOCK-DOWN POULTRY HOUSE AND RUN

Skids

4 pcs. 2" x 4" x 8'

Floor

30 pcs. 1" x 4"—8' T & G

Corner posts

2 pcs. 2" x 3"—10'

Side wall cleats

4 pcs. 1" x 4"— 8'
2 pcs. 1" x 6"—10'

Rear wall cleats

3 pcs. 1" x 4"—8'

Front wall cleats

4 pcs. 1" x 4"—8'

Roof cleats

1 pc. 2" x 3"—10'
3 pcs. 1" x 4"—10'
2 pcs. 1" x 3"— 8'
4 pcs. ½" x 3"— 9' to batten paper

Wall Sheathing

1" x 4" T & G to be laid vertically

Side wall

30 pcs. 1" x 4"—10' T & G
One long and one short length from each piece

Rear wall

31 pcs. 1" x 4"—4' T & G

Front wall

4 pcs. 1" x 4"—6'
27 pcs. 1" x 4"—3' T & G

Roof

33 pcs. 1" x 4"—9' T & G

Door jamb and cleats

1 pc. 1" x 3"—12′ 1 pc. 1" x 3"—8′

Droppings board

10 pcs. 1" x 4"—8′ T & G 1 pc. 1" x 4"—8′

Roosts

2 pcs. 2" x 2"—10′

Fowl door and guides

1 pc. 1" x 12"—6′

Curtain

1 pc. 1" x 3"—16′ 4 pcs. 1" x 3"— 4′
2 pcs. 1" x 3"—12′ 1 pc. 2" x 2"— 6′
2 pcs. 1" x 3"— 8′

Knock-down run

Side rails

4 pcs. 1" x 4"—12′

End rails

2 pcs. 1" x 4"—10′

Uprights

1 pc. 2" x 2"—10′ 1 pc. 1" x 4"—10′

Cover

2 pcs. 1" x 3"—12′ 1 pc. 1" x 3"—14′
2 pcs. 1" x 3"—10′ (removable top door)

Roofing

1 roll 3-ply roofing

HARDWARE FOR KNOCK-DOWN HOUSE

House

8 lin. ft., 36-inch width 1-inch mesh poultry netting.
5 pair 3" light strap hinges
2 pair 3" light T-hinges
1 Whitcomb No. 2 J barn door latch
4—2" hooks and eyes
4—2" Jap. buttons
2—3" hasps (to secure roof to front and rear walls)
12—¼" x 3½" machine bolts (for K. D. corners)
4—¼" x 7" machine bolts for roosts
4—¼" x 4" machine bolts for roosts

Coop

8—¼" x 3½" machine bolts with washers and wing nuts
32 lin. ft. 24-inch width 1" mesh poultry netting
12 lin. ft. 60-inch width 1" mesh poultry netting

Paint

½ gal. ready-mixed outside paint (color as desired).

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